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Evaluation of a Nurse-led Postpartum Self-care Program for First-time Mothers in Bangladesh

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Evaluation of a Nurse-led Postpartum Self-care Program for First-time Mothers in Bangladesh

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ABSTRACT

Background: Postpartum complications fatigue, depression, and postpartum maternal malfunctioning is a public health problem. Nurse-led postpartum self-care is a new intervention in Bangladesh implemented for first-time mothers.

Purpose: This study was aimed to test the effectiveness of nurse-led postpartum self-care intervention in reducing postpartum fatigue, depressive mood, and promoting postpartum maternal functioning.

Methods: A non-synchronized design with pretest and post-test. Samples were 68 first-time postpartum mothers 34 in experiment and 34 in control group purposively selected from Dhaka Medical College Hospital, Bangladesh. There was attrition rate 23.5%, in follow-up at 2 weeks and 16.1% at 6 weeks. Measurements of this study were postpartum fatigue, depressive mood, postpartum maternal functioning, postpartum self-efficacy, self-care behavior, and postpartum self-care knowledge. Data were collected by face-to-face interview and mail and maintained confidentiality.

Data were analyzed from 68 samples (34 Control & 34 Experimental) using by computer software IBM SPSS program version 21. Demographic data were analyzed

by descriptive statistics, using frequency, percentage, mean, and standard deviation. Bivariate statistics- t-test, Chi-square were used to examine homogeneity of variances, and matched pair t- test, and Independent t-test were used to examine differences between groups. Advanced statistics linear mixed model was used to control covariates and test the efficacy of treatment.

Results: In this study a high proportion of new mothers had depressive mood (≥ 13). After efficacy testing over time, findings showed that the nurse-led postpartum self-care intervention were statistically significant in decreasing postpartum fatigue ($\beta = -6.17$; $SE = 1.81$; $t = -3.39$; $p = < .01$); and increasing maternal functioning at 6 weeks postpartum in the experimental group ($\beta = 13.72$; $SE = 3.67$; $t = 3.73$; $p = < .01$) compared to control group. However, there were no statistically significant differences for postpartum depressive mood over time. Knowledge was also statistically significant for increased maternal functioning over time ($\beta = .37$; $SE = .18$; $t = 2.03$; $p = < .05$)

Conclusion: This study found that a nurse-led postpartum self-care intervention, focusing on strategies for increasing self-efficacy, was feasible and effective in improving fatigue and maternal functioning in new mothers by 6 weeks postpartum. PP care knowledge was effective in improved maternal functioning, and thus supports

implementing the NL PPSC for new mothers following delivery. Further studies are needed to expand the NL PPSC in terms of intensity and/or frequency of contact, as well as consider follow up measurement for a longer period. Further exploratory and interventional studies are also needed on postpartum depression, and development of postpartum self-care instruments based on Bangladesh context.

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I. INTRODUCTION

A. Significance of the Study

The postpartum period during the first 4-6 weeks following childbirth, is an important phase for mothers, not only for their physiological recovery but also for dealing with the adjustments required of becoming a mother and learning to care for their newborn (Fahey & Shenassa, 2013). Postpartum care is a neglected area of care related to childbirth, despite developing countries' repeated calls for improvement (Darling & Benjamin 2014; Smith, 2011).

Approximately 600,000 women die worldwide due to pregnancy-related complications and 99% of these deaths occur in developing countries. Among these deaths, more than 50% occur during the postpartum period (WHO, 2005). Insufficient postpartum knowledge among the first time mothers results in postpartum women who are less skilled in adapting to their new situation (Nazik, & Eryilmaz, 2013; Giallo et al, 2014; Wiegers, 2006). Postpartum self-care interventions may improve mothers' knowledge related to postpartum complications (Darling & Benjamin 2014) and preventive measures to avoid complications especially for first-time mothers

who may have insufficient parenting knowledge and self-confidence (Giallo et al, 2014; Jeon & Hwang, 2013; Nazik, & Eryilmaz, 2013). In this regard, the American College of Obstetrics and Gynecology (ACOG, 2007) recommends action to ensure that all new mothers have sufficient knowledge of postpartum care and can demonstrate the skills needed to perform self-care at home, before hospital discharge.

Postpartum fatigue is a complication which has a negative impact on depression (Bozoky, & Corwin, 2002; Corwin et al, 2005; Doering et al, 2009; Giallo, Rose, & Vittorino, 2011; Kim & Dee, 2017;) and self-care in daily functioning (Dunning et al, 2013; Giallo et al, 2014). Inversely, maternal functioning has a significantly positive correlation ($p = 0.001$; $r = 0.27$) with first-time mothers' self-efficacy (Shafaie, Mirghafourvand, & Bagherinia, 2017). Thus, less postpartum fatigue may be influential in increasing maternal functioning. Nurses are in a key position to intervene to facilitate decreased postpartum fatigue (Barbosa et al, 2016; Giallo et al, 2014; Varcho, Hill, & Anderson, 2012), screening for depression (Ho et al., 2009; Schaar & Hall, 2013), and increasing maternal functioning (Bagherinia, Mirghafourvand, & Shafaie, 2016; Barkin et al., 2010) for the wellbeing of mothers and newborns alike.

In Bangladesh, mothers do not often seek postpartum care services after

childbirth, except in cases of serious complications, for example perineal infection (Koenig et al, 2007). Although the Bangladesh maternal mortality rate (MMR) was reduced from 399 in 2000, to 176 in 2015-; it is still a major challenge-. (World Health Organization, 2015). According to the 2014 Bangladesh Demographic and Health Survey (National Institute of Population Research and Training, [NIPORT] 2016), the postpartum mortality rate is 10 per 1000 births; and 63.6% of mothers do not receive postpartum care from trained personnel within 2 days of childbirth. This is most likely due to the high rate of home births (69%), which is reflected in the Bangladesh Bureau of Statistics'- (BBS, 2013) 2013 report, which also notes that normal childbirth accounts for 83.6% of all births. The major causes of maternal death in Bangladesh are postpartum hemorrhage (31%), eclampsia (20%) and other indirect causes, (NIPORT, MEASURE Evaluation, & icddr, 2012), including postpartum anemia (21%; Khatun, et al, 2012). Puerperal sepsis is the second leading cause of maternal death in Bangladesh (Taskin et al, 2016). A study of 488 mothers at 6-9 weeks-, found among 35% were first-time mothers-, (Hamadani et al, 2012) and 62% experienced at least one morbidity which hampered postpartum self-care. Findings of a quasi-experiment study of safe motherhood (Kamiya, Yoshimura, and Islam, 2013) highlighted an urgent need for postpartum self-care programs to increase postpartum self-care knowledge,

self-efficacy, and positively with the aim of affecting postpartum maternal health outcomes-, for new mothers. Postpartum complications such as fatigue, depressive mood, and postpartum maternal malfunctioning are important issues that require special attention from nurses and health care professionals.

B. Purpose of the Study

This study developed a nurse-led postpartum self-care (NL PPSC) program for first-time mothers in Bangladesh and evaluated its efficacy on maternal health outcomes.

Specific goals were as follows:

1. To examine the differences of process indicators (postpartum self-care, postpartum self-efficacy, and postpartum care knowledge) within the Experimental and Control groups and between the two groups.
2. To examine the differences of outcome indicators (postpartum fatigue, depressive mood, and maternal functioning) between the Experimental and Control groups, over 3 times points.

In this study, it was hypothesized that mothers in the Experimental group would demonstrate:

- 1.1) Greater decrease in postpartum fatigue than the Control group
- 1.2) Greater decrease in depressive mood than the Control group
- 1.3) Greater increase in postpartum maternal functioning than the Control group

II. REVIEW OF THE LITERATURE

This chapter focused on a review of publications from various databases:- including PubMed, CINAHL, EMBASE, Cochrane library, and Google scholar, as well as manual search for related materials used in Bangladesh. Relevant articles published in English from 2000-2017 were included in the literature review. In addition, some classic articles on self-efficacy theory were included. This review is organized into three sections: (A) postpartum care in Bangladesh, (B) factors related to postpartum care, and (C) effects of postpartum interventional programs. These are discussed in detail as follows.

A. Postpartum Care in Bangladesh

Postpartum refers to the period from delivery to the return back to pre-pregnant state, and usually describes the first 6 weeks following childbirth (Ladewig et al, 2002). Postpartum care is critical but often neglected (Darling, & Benjamin, 2014; Smith, 2011). In Bangladesh, postpartum care considered is to be a crucial component of safe motherhood and provides health care professionals with the opportunity to detect potential complications and counsel mothers about how to care

for themselves and their newborns (Chakraborty et al, 2002; Chowdhury et al, 2007; Kamiya, Yoshimura, & Islam, 2013). In Bangladesh, a large number of births occur at home (69%) (Bangladesh Bureau of Statistics, BBS, 2013) and the postpartum period is often considered by mothers to be a normal phenomenon that does not require special attention. Thus, mothers do not usually seek postpartum care service except in case of major illness (Koenig et al, 2007). According to the 2013 Bangladesh Demographic Health Survey (NIPORT, 2013) 73% of women in Bangladesh do not received postpartum care from a trained care provider within 2 days of delivery. Currently maternal health facilities in Bangladesh have achieved success in reducing the MMR from 399 in 2000, to 319 in 2005, and to 176 in 2015 (Arifeen et al, 2014). However,- according to WHO survey in 2015, the MMR in Bangladesh was still higher than neighboring countries such as India (MMR 174), Bhutan (148), Sri-Lanka (30), China (27) and Thailand (20) (World Health Organization, 2015).

Bangladesh was reported as having one of the highest adolescent fertility rates in the world, with 113 per 1,000 women giving birth at less than 20 years-old (United Nations Fund for Population Activities, [UNFPA] 2016). Based on another demographic and health survey conducted in Bangladesh in 2014 (NIPOTR, 2016),

the total fertility rate for the age group of 15-49 years was reported to be 2.3-, and adolescent fertility was reported 31%. While most births in Bangladesh are reported as normal deliveries (83.6%) many births take place in the home (69%) or occur in Government hospitals (14%) (BBS, 2013). Only around half (54%), of pregnant women receive antenatal care (ANC) from medically trained personnel at least once during their pregnancy, and less than one-third (31%) receive ≥ 4 ANC visits by a health care provider (NIPOTR, 2016), which is the minimum requirement suggested by WHO. In another report 42.6% mothers in Bangladesh did not receive any postpartum care visits at all (BBS, 2013).

In Bangladesh, the rate of receiving postpartum care within 2 days from trained personnel was 36.4% and the postpartum mortality rate was 10 per 1000 live births (NIPOTR, 2016). The neonatal mortality rate was 28 per 1000 live births (NIPOTR, 2016) which may be linked to new mothers' lack of postpartum knowledge, skills, and support.- Indeed, in one survey, 19% of mothers reported no knowledge regarding their baby's vaccination needs (BBS, 2013). For other related statistics;- exclusive breastfeeding up to 6 months is reported at a rate of 55%, and 18.6% mothers are underweight ($BMI < 18$) (NIPOTR, 2016), suggestive of poor nutritional status. Furthermore, the prevalence of contraceptive use in Bangladesh is reported to

be 62% and the average number of children per women is 2, which indicate mothers need contraceptive information.

High adolescent fertility rates coupled with a tendency for home birth without skilled attendance (Sikder et al, 2014), may lead to postpartum complications and a higher risk for maternal death (Kamiya, Yoshimura, & Islam, 2013). The major postpartum complications noted in Bangladesh (NIPORT, MEASURE Evaluation, & icddr, 2012) are postpartum hemorrhage (PPH), puerperal sepsis (Taskin et al., 2016), anemia, and hemorrhoids (Ferdous, et al., 2012); with additional conditions substantially affecting postpartum maternal health such as stress incontinence, breast abscess, mastitis, vesico-vaginal fistula, rectovaginal fistula, genital prolapse, depression, and postpartum fatigue reported major causes of maternal death. In terms of reported major causes of maternal death in Bangladesh, PPH (31%) and eclampsia (20%) are notable (NIPORT, 2012), followed by other indirect causes (21%; Khatun et al, 2012). Hamadani and colleagues (2012) conducted a study (n = 488) at 6-9 weeks postpartum in Bangladesh aimed to examine the relationships between maternal postpartum health condition and maternal caregiving practices to their babies. Findings showed that 35% were first-time mothers, and 62% reported experiencing at least one postpartum morbidity that hampered care behaviors. In this

regard, findings of a quasi experiment study in Bangladesh (Kamiya and colleagues, 2013) supported to develop capacity to tackle maternal and newborn health problems and enhancing postpartum mothers' self-care knowledge and behavior.

B. Factors Related to Postpartum Care

The literature notes that insufficient postpartum self-care knowledge (Giallo et al., 2014; Park et al., 2003) and lack of postpartum self-efficacy (Shin et al., 2000) influences self-care behavior and postpartum maternal functioning (Bagherinia et al., 2016; Birkin et al., 2010, & Shafaie et al., 2017). Improved knowledge and engagement in postpartum health-related activities elevate mothers' self-care and improve their health status (Birkin & Wisner, 2013; De-Oliveira et al., 2015; & Giallo, et al., 2014). Therefore, the promotion of comprehensive postpartum self-care may extend mothers' understanding of self-care especially for first-time mothers (Nazik, & Eryilmaz, 2013; Giallo et al., 2014). This approach is feasible when maternal nurses and other health care providers may render this care in hospital settings. Risk factors for obstetric complications, such as young maternal age (< 18 years old), and nulliparity (Sikder et al., 2014) can affect whether postpartum care can be adequately obtained. Furthermore, postpartum complications, especially postpartum fatigue (Ansara et al,

2005) and depression (Kuo et al, 2012) may interfere with mothers' ability to care for themselves and their infant (Anthony, Mawson, and Wangb, 2013; Eryilmaz, & Kilic, 2011; Giallo et al., 2014). Cultural attitudes towards postpartum depression is unacknowledged and neglected in Bangladeshi communities (Willlium, Sarker, and Ferdous, 2017).

In Bangladesh, some factors, such as distance from health facilities, long waiting times, the traditional belief that childbirth is an act of God, and health care provided by a male physicians may make women reluctant to seek maternal care services (Gayen & Raeside, 2007). Rahman, Haque and Zahan (2011) conducted a study to identify factors affecting postpartum care among mothers in Bangladesh and reported that mothers' awareness about utilization of postpartum care, maternal age at delivery, place of delivery, residence, income, husbands' occupation, concerns about postpartum complications, and mothers' autonomy affected. Another study (Taskin et al., 2016) reported that puerperal sepsis is significantly associated with young maternal age (< 25 yrs) (OR: 5.22; CI 2.25-12.08) and low maternal education (OR: 3.56; CI 1.59-7.85). There are 39% pregnant woman reported anemia defined as Hb <110g/L are potential risk for postpartum period (Institute of Public Health Nutrition; & Helen Keller International, 2004) due to lochia discharge and breast

feeding. Postpartum care awareness and anemia were also shown to be a significant factor for postpartum care in other studies (Hamadani et al., 2012; Rahman, Haque and Zahan, 2011). For example, Hamadani's study found that maternal education and anemia (Hb <11g/dl based on HemoCue) were significantly associated with maternal postpartum self-care activities and ability to care for their infant.

A randomized control trial (RCT; Barnes et al, 2017) reported that, compared to providing standard care, it was more feasible and cost-effective to implement a nurse-led intervention for postpartum care. Bangladeshi mother may feel more comfort with female maternal nurse instead of male care provider. In order to promote maternal health in Bangladesh, some communities and slum areas are covered by programs such as the International Center for Diarrheal Disease and Research, Bangladesh (ICDDR'B) and the Bangladesh Rural Advanced Community (BRAC), which provide door-to-door services including identifying postpartum complications and arranging referrals (Jolly et al, 2016). In addition, the government is expanding health access through electronic media, especially for maternal health services. For example, national electronic health (eHealth) strategies have been initiated to incorporate Information Communication Technologies (ICTs) into the Bangladesh health system, and align with the Digital Bangladesh Vision 2021

(Birdsall, 2014). Various stakeholders are involved, especially the Mobile Alliance of Maternal Action (MAMA) Bangladesh (MAMA, 2013)-, which is a leading mobile health service for maternal health outcomes. However, these services lack opportunities for exchange and assurance of understanding or individualized care, and cannot substitute postpartum care provided by health professionals.

In Bangladesh, these findings underscore the need for particular attention during the postpartum period focusing access of postpartum care and increased awareness and knowledge of postpartum care activities, especially among young mothers those who lack resources, and those with vulnerabilities such as fatigue or depression. Maternal nurses who are mostly women, fit the cultural expectations of Bangladeshi women regarding to postpartum care, and can play a strategic role in delivering postpartum care, but there is a current lack of studies focusing on nurse-led programs in Bangladesh. .

C. Effects of Postpartum Intervention Programs

Postpartum self-care interventions refer to non-pharmacological behavioral and/or educational programs that encourage mothers to perform healthy behaviors in order to promote and maintain their health. Specifically, such programs may assist

mothers to acquire knowledge related to postpartum care demonstrate self-care behavior, and encourage independent performance, leading to confidence in performing self-care behavior and better adaption to the maternal role (Giallo et al., 2014 & Nazik et al., 2013). Due to lack of parenting experiences, first-time mothers are not well informed about postpartum self-care and preserving physical energy and thus may benefit more from postpartum self-care interventions (Cooklin, Giallo, and Rose, 2011; Giallo, Rose, and Vittorino, 2011). A literature review was done interventions for postpartum self-care fatigue management postpartum depression, sleep disorder, anxiety, and stress from postpartum immediate to 1 year post delivery. In one US study, maternal nurse Interventions using educational booklet and demonstration in hospital prior to discharge resulted in statistically significant increases of self-care management (Buchko & Gutshall 2012a; 2012b; The effect of postpartum video education on the knowledge and self-efficacy of postpartum care in primiparous (Lee, 2003). Another quasi experimental study (Oleiwi, & Ali, 2010) determined the effectiveness of a nurse-led intervention among 60 primiparous pregnant women in Iraq focusing on postpartum self-care about episiotomy and perineal care. Findings were that, most women met their of perineal care needs including maintaining, cleanliness of the perineum, using ice packs, taking soothing

bath, using dry heat, refraining from sexual relationship, taking adequate nutrition, preventing constipation, performing pelvic floor muscles exercise, and follow up.

Another study focusing on knowledge and attitudes of postpartum mothers regarding self-care after childbirth in a large Indian city (Darling & Benjamin, 2014), reported that only 46% of mothers had adequate knowledge of postpartum self-care and 47% had a moderate level of knowledge. In the same study, 25% of new mothers had a positive attitude towards self-care and 60% reported feelings neutral. They also reported a significant association between postpartum self-care knowledge and education, monthly income, and obstetric score ($P < 0.05$); and postpartum self-care attitude and obstetric score ($P < 0.05$). Another study (Boyle et al, 2012) found that an educational intervention for pelvic floor muscles exercises during pregnancy and the postpartum period was effective for first-time mothers and reported that the intervention group was less likely than the control group to experience persistent urinary incontinence as a result of postpartum self-care behavior 12 months after delivery (40% less; RR 0.60, 95% CI 0.35 to 1.03). This kind of efficacious self-management involves perceived confidence and demonstration of cognitive and behavioral responses for improved quality of life (Omisakin & Ncama, 2011). The individual's knowledge, beliefs, self-regulation skills and social support affect the

initialization of self-management behaviors (Ryan & Sawin, 2014).

For postpartum fatigue management, two different Australian RCTs (Dunning et al, 2013; Giallo et al., 2014) used a psycho-educational intervention-, named Wide Awake Parenting (WAP). It was a self-directed written workbook containing fatigue management activities, which was followed by professionally-led telephone support and home visits to clarify the content and address any difficulties experienced by the by the mothers. This intervention focused on four aspects: fatigue and exhaustion; tips for charging up; tips for saving energy; and making plan work for oneself to strengthen maternal self-efficacy, and willingness to prioritize tasks and self-care behaviors which significantly effect self-care behavior ($f = 8.95$, $p < .001$), daily functioning, and quality of life. Another two studies (Troy & Dalgas-Pelish, 2003a; Varcho, Hill, and Anderson, 2012) introduced a self-care guide Tired Management Guideline (TMG), describing eight potential sources of postpartum fatigue, and listing several suggestions or techniques that the mother may use to manage postpartum fatigue. Another approach which has been used to decrease postpartum fatigue in both Iran and Taiwan is low intensity exercise such as Pilates (Ashrafinia et al, 2015; Ko, Yang, and Chiang, 2008). Pilates home exercise, consisting of a set of 13 yoga movements, and music were shown to be significantly

effective in reducing general fatigue ($p < 0.001$), physical fatigue ($p < 0.001$), and improving mental fatigue ($p < 0.001$). Based on these findings, basic requirements for postpartum mothers' healthy self-care behaviors and alleviation of fatigue include conserving energy, improving quality of diet, increasing exercise, reducing daily demands, maintaining regular sleep routines, and allowing time for rest. Information in written format was shown to be helpful for mothers to follow at home.

Nurse-led postpartum interventions has a role in promoting postpartum health and cost effective care (Barnes et al., 2017). Prior to hospital discharge, postpartum new mothers need comprehensive postpartum care knowledge and should be able to demonstrate self-confidence in adequately caring for their infant as well as their own wellbeing (Çinar & Öztürk, 2013). The American College of Obstetrics & Gynecology (ACOG, 2007) recommends that the maternal nurse has a role to promote postpartum mothers' knowledge and initiate the performance of self-care at home. Nurses' initiation of postpartum fatigue management has been shown to increase efficacy (Giallo et al., 2014).

In conclusion, these studies established the importance of various postpartum care interventions but they may not apply in Bangladeshi study populations due to contextual differences. Therefore, in spite of some supportive findings-, clear guideline for developing a conceptual framework and the contents of postpartum self-management interventions in Bangladesh context remain lacking.

III. CONCEPTUAL FRAMEWORK

The conceptual framework for this study was based on the concepts of self-efficacy theory (Bandura, 1977, 1994, 1997) as a component of social cognitive theory (Bandura, 1986) and linked to health as the final outcome. Health refers to physical and psychological wellbeing. According to WHO (1998), health is a resource for everyday life, not the object of living. It is a positive concept emphasizing social and personal resources, as well as physical capabilities. Although Bandura does not specify health as the outcome of behavior or self-efficacy, numerous studies have reported this connection. This study also posited that the practice of health behaviors would ultimately impact positively on health status.

Self-efficacy is defined as the belief in one's ability to successfully accomplish a given task (Bandura, 1977; 1997). It influences perception and motivation, thus enabling individuals to accomplish a specific task, performance, or behavior. According to Bandura (1977), self-efficacy is derived from four principal sources: (1) enactive mastery (performance accomplishment), (2) vicarious experience, (3) verbal persuasion, and (4) physiological arousal. Through these sources, different

modes of intervention may be operated (Figure 1).

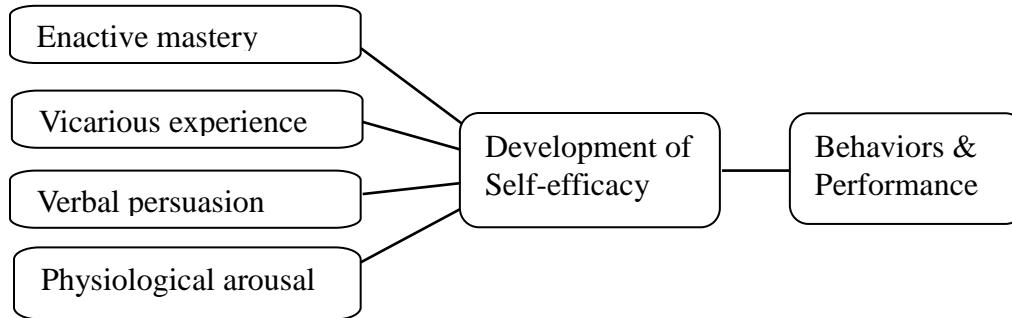


Figure1: Major sources of self-efficacy (Bandura, 1977)

Enactive mastery: Bandura stated that through enactive mastery individual develop a strong ability to perform behaviors. Individuals’ previous experience or knowledge, help them to become more efficacious to complete a given tasks. In the case of no previous knowledge, an intervention may be implement to promote efficacy.

Vicarious experience: Vicarious experiences are another source of self-efficacy where people learn from modeling or demonstration. If people observe another’s-’ performance of a role, they feel more efficacious to perform similar tasks. In this sense Bandura (1977, 1994) stated that “Seeing people similar to oneself succeed by sustained effort raises the observer’s beliefs that they, too, possess the

capabilities to master comparable activities to succeed.”

Verbal persuasion: Verbal persuasion is a motivational approach to encourage people to be efficacious. If someone encourages a person to believe that they would be able to, or have the skills necessary to successfully perform the a task, then that person become more confident and convinced in their ability to succeed at the particular tasks.

Physiological arousal: Physiological arousal or state is the individuals’ response that influences their level of perceived self-efficacy. If the individual expects to be efficacious, their understanding about the specific task is expressed as facial expressions, interactions, or feedback.

Postpartum self-efficacy may be developed to facilitate mothers feeling more confident to perform self-care behaviors which ultimately promote postpartum health (Logsdon et al, 2010.)

Conceptual Framework for this study

The concept of self-efficacy is well matched with for nursing practice. Postpartum self-efficacy has been shown to positively affect mothers ability to perform self-care behaviors and promote postpartum health (Giallo et al., 2014; Jeon

& Hwang, 2013; Leahy-Warren, & McCarthy, 2011). In nursing literature, self-efficacy theory has been shown to have been successfully used in postpartum care (Logsdon et al., 2010) to promote health benefits. Therefore, a modified conceptual framework for postpartum self-efficacy was conceptualized for this study. In this framework, there are 3 constructs: (1) personal characteristics, (2) process indicators, and (3) outcome indicators. Personal characteristics consist of an individuals' socio-demographic characteristics and delivery related characteristics. These are postulated to influence the three process indicators, (knowledge, belief, and behavior) at the conceptual level,- as well as postpartum care knowledge, postpartum self-efficacy, and postpartum self-care, variables. Similarly, process indicators are postulated to exert influences on health-, which is the outcome indicator. In this study, health refers to three variables,- postpartum fatigue, depressive mood, and maternal functioning. Based on self-efficacy theory (Bandura, 1977, 1994) sources of efficacy may influence an individual's personal knowledge, and belief or self-confidence which influence to their performance of behaviors. In this regard the NL PPSC program was posited to effect process and outcome variables, as depicted in figure 2. The NL PPSC program built on the four sources of self-efficacy, enactive mastery, vicarious experience, verbal persuasion, and physiologic arousal- and ultimately

aimed to alleviate postpartum fatigue and depressive mood, and positively affect maternal functioning.

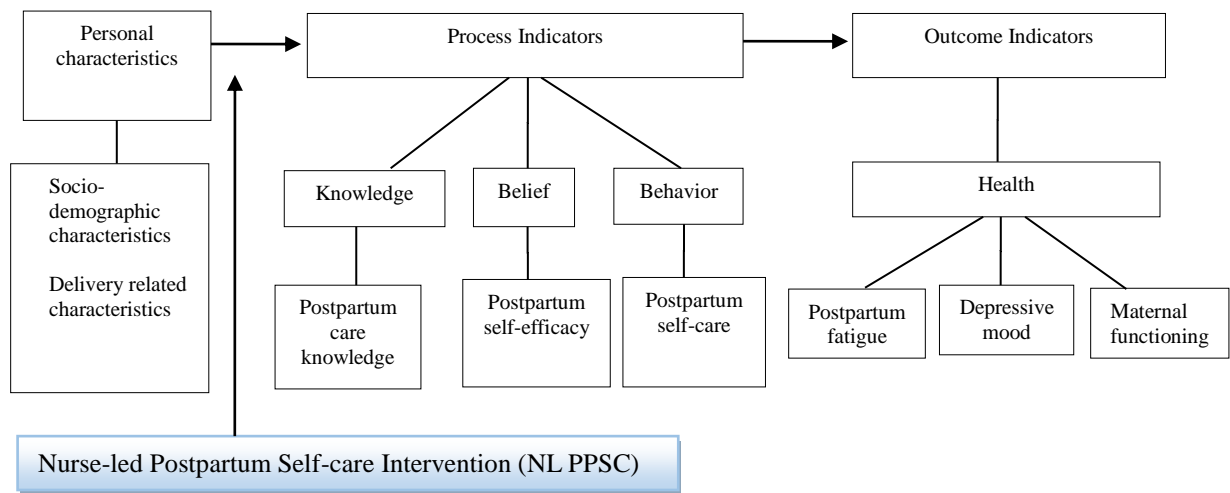


Figure 2: Conceptual Framework for this study

Specifically for the variables of this study, postpartum care knowledge is maternal knowledge regarding postpartum signs and symptoms relating to the postpartum mothers physical condition and behavior. For example, knowing about vaginal discharge, using contraceptives, timely breast feeding, pelvic floor exercises, etc., (Mirzaee et al, 2013; Park et al., 2003).

Postpartum self-efficacy is the mother's belief and confidence in her ability

to execute necessary courses of action directly after and for 6 weeks directly following childbirth (Logsdon et al., 2010). Studies found that self-efficacy enabled postpartum mothers to perform fatigue management self-care behaviors based on their individual judgment (Giallo et al., 2014; Jeon & Hwang., 2013).

Postpartum self-care behavior is the mothers' behavior or performance of tasks that they undertake to achieve health benefits. In the health promotion glossary, WHO (1998) described health behaviors as any activity undertaken by an individual, regardless of actual or perceived health status, for the purpose of promoting, protecting, or maintaining health. In this study, self-care behavior was considered to be posited as such a health behavior, and refers to a postpartum mothers' - behaviors undertaken to promote her health status, i.e., caring for her own postpartum recovery, as well as for the health condition of her newborn.

In this study health is measured by the variables of postpartum fatigue, depressive mood, and maternal functioning, which are posited to be interrelated. Postpartum fatigue refers to an overwhelming,- and sustained sense of exhaustion and decreased capacity for physical and mental work (NANDA, 2001; Runquist, 2007; Troy & Dalgas-Pelish et al, 2003a). Postpartum fatigue can have unpleasant effects on maternal health and functional status. Postpartum depressive mood refers

to the degree of depressive symptoms following birth and during the postpartum period. Postpartum maternal functioning are maternal activities to maintain the health of a mother and her newborn baby (Giallo et al., 2014; Shorey et al, 2014). Postpartum fatigue and depression can interfere with the ability to perform maternal functioning.

IV. METHODS

A. Research Design

This study employed a non-synchronized design with a pretest and two post-test periods. To avoid diffusion of the intervention, data from the Control group were collected first, during the months of May to June 2017, followed by the Experimental group, from July to September 2017 (Figure 3).

Group	Time	
	May-Jul 2017	Jul-Sep 2017
Control	C ₁ , C ₂ , C ₃	
Experimental		E ₁ <u>X₁</u> E ₂ <u>X₂</u> E ₃

E₁, C₁ = Postpartum (PP) fatigue, depressive mood, PP maternal functioning, PP self-care
PP self-efficacy, PP care knowledge, demographic and delivery related
characteristics.-

E₂, C₂, E₃, C₃ = Postpartum fatigue, depressive mood, maternal functioning, PP self-care
PP self-efficacy, and PP care knowledge

X₁ = Two sessions face to face (In hospital) + phone counseling at PP 2 wks

X₂ = Intervention via phone counseling at PP 4 wks.

Figure 3. Design of the study

B. Sample and Sampling

For this study participants were postpartum mothers who delivered their babies and received postpartum care at Dhaka Medical College Hospital (DMCH), Dhaka, Bangladesh. DMCH is a large public tertiary level 2700 bedded hospital situated in Dhaka, (the capital of Bangladesh)- where women from across the region come to give birth. Participants were selected via convenience sampling, based on the following inclusion and exclusion criteria:

Inclusion criteria: (1) First-time mother, (2) spontaneous vaginal delivery, (3) baby's 5 min APGAR ≥ 6 , (4) postpartum duration ≤ 1 week, (5) ability to read and understand written Bengali and (6) willing to participate.

Exclusion criteria: (1) multiple infants, (2) chronic disease (defined as diabetes, hypertension, bronchial asthma etc.) or any postpartum complication, i.e. postpartum bleeding, puerperal sepsis, or psychosis, (3) had received newborn's vaccines at places other than DMCH and the Expanded Program of Immunization (EPI) center in Mohakhali, Dhaka, and (4) no access of telephone.

Sample size was calculated by using computer software G*Power, with effect size $d = 0.5$; α err prob 0.05; and Power ($1 - \beta$ err prob) 0.95, which had showed a minimum of 27 participants in each group. The expected attrition rate was estimated

at range 15-25% due to possibility of drop out in 2 and 6 weeks post intervention (Giallo et al., 2014). Therefore the total sample size was 68 mothers, i.e., 34 in the experimental and 34 in the control group.

Recruitment process

The researcher met with the nursing superintendent, obstetrician, head of the department of obstetrics and gynecology, and head nurse of the postpartum ward to explain the study purpose of the study and request their cooperation. With permission, flyers were posted around the postpartum unit to invite new mothers to voluntarily join the study. Potential participants could show their interest by approaching nurses on the postpartum ward, who acted as a ‘bridge’ between the potential participants and the researcher. The ward-in-charge nurse advertised the study and performed the initial screening for potential participants.

After receiving notice of mothers who were interested in participating in the study, the researcher approached the mothers on the ward and explained the purpose and process of this study as well as the voluntary nature of participation. An information sheet in Bengali was provided and the researcher explained to the mothers that their participation might not give them direct benefits presently, but

findings of the experimental study may be helpful in developing postpartum self-care guidelines for first-time mothers in the future. Ample time was given for potential participants to ask questions about the study. If mothers agreed to participate, the researcher screened for exclusion criteria and obtained written consent.

C. Instrumentation

This study used a set of seven instruments, consisting of a total of 104 items, which took around 20-30 minutes to answer. Permission to use the instruments was obtained from the original authors except for the postpartum depression scale, which is available for free access. The measurements of this study are shown in Table 1.

Table 1. Measurements of the study

Construct	Concept	Variable	Tool	Details	Cronbach's alpha
Outcome indicators	Health	Postpartum fatigue	PP Fatigue Scale (Milligan, Parks, Kitzman, and Lenz, 1997)	10 items 4 point scale	.77
		Depressive mood	Edinburgh Postnatal Depression Scale (Cox et al., 1987)	10 items, 4 point scale	.86
		Maternal functioning	Barkin Index of Maternal Functioning (Barkin et al., 2010)	20 items 7 point Likert scale range	.87
Process indicators	Behavior	Postpartum self-care	Self-care practice Instrument (Denyes, 1990)	18 items, 7 point scale	.82-89
	Belief	Postpartum self-efficacy	Modified from PP management self-efficacy tool (Shin et al., 2000)	15 items, 4 point scale	.90
	Knowledge	Postpartum care knowledge	Modified PP Self-care knowledge scale (Park et al., 2003)	19 items, Yes/No/ don't know response	.76 Pre .73 Post
Personal characteristics	Socio-demographic characteristics	Age, educational level, living status, occupation, monthly family income	Developed based on the literature	5 items	-
	Delivery-related characteristics	Episiotomy, gestational age, PP duration, general condition of newborn, sex of newborn, numbers of participation in parenting preparation class, & numbers of ANC visits.	Recorded from delivery chart	7 items	-
Total				104 items	

PP = postpartum; ANC = antenatal care

Outcome Indicators

1. Postpartum Fatigue

Postpartum fatigue was measured by using the Postpartum Fatigue Scale (PFS, Milligan, Parks, Kitman, & Lenz, 1997). The PFS is a 10 item, 4 point Likert scale (1= Not at all; 2 = Rarely; 3 = Sometimes; 4 = All the time) consisting of 2 dimensions: physical fatigue (4 items) and mental fatigue (6 items). Scores were added to obtain a total score,- (possible range 10-40), and higher scores indicated greater fatigue.

The PFS had good internal consistency in the original study (Milligan, Parks, Kitman, & Lenz, 1997) with Cronbach's alpha of .77. In this study the Cronbach's alpha ranged from .35 to .82 across the three time points.

2. Depressive Mood

Depressive mood was measured by using the Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden and Sagovsky, 1987), a 10 item 4 point Likert scale (0-3). There were 7 negative items (item numbers 3, 5, 6, 7, 8, 9 and 10), which were reversed before analysis. Scores were added to obtain a total score (possible range 0-30) and higher scores indicated greater depressive symptoms. In Western countries

cutoff score greater than 12 or 13 is used indicate the need for health professional's aid (Cox et al., 1987). In a systematic review in India (Upadhyay, Chowdhury, Aslyeh, Sarkar, Singh, Sinha, & Kumar, 2017) among 38 studies 29 used the EPDS to measure postpartum depression. Studies in Nepal (Bushal et al, 2016) and Bangladesh (Gausia et al, 2007) have adopted the same cutoff score of 12/13. Due to cultural attitudes stigmatization towards postpartum depression in Bangladesh (Willlium, Sarker, and Ferdous, 2017), a cutoff score of 13 or above was used for this study. Cronbach's alpha of this tool was .86 in the original study (Cox, Holden, and Sagovsky, 1987), .70 in a prior survey of Bangladesh new mothers (Khatun et al., in press), and ranged from .48 to .56 across the three time points in this study.

3. Maternal Functioning

Postpartum maternal functioning was measured using the Birkin Index of Maternal Functioning (BIMF; Barkin et al., 2010). The BIMF is a 20 item 7 point Likert scale (0 strongly disagree, to 6 strongly agree) scores were added to obtain a total score (possible range: 0-120) and higher scores indicated higher postpartum maternal functioning. The Cronbach's alpha of this tool was .87 in the original study (Barkin et al., 2010) and in this study Cronbach's alpha ranged from .53 to .89 across

the three time points.

Process Indicators

4. Postpartum Self-care

Postpartum self-care was measured using Denyes' (1990) Self-Care Practice Instrument (DSCPI-90®). This is an 18 item instrument which is used as a general measure of self-care actions that meet universal self-care requisites. This instrument has also been used with healthy adolescents and midlife women in previous studies (Burdette, 2012). Therefore it was selected for use with healthy postpartum mothers. In this study, items were adapted for the postpartum context. A seven point Likert-type response format (1= strongly disagree, to 7 = strongly agree) is used and items are summed with a total possible range of 18-126 points. Higher scores reflect higher levels of self-care behavior. Cronbach's alpha coefficients have been reported as between .82 to .89 (Denyes, 1990) and ranged from .47 to .86 across the three time points in this study.

5. Postpartum Self-efficacy

Postpartum self-efficacy was measured by modifying the Postpartum Management Self-efficacy Tool (Shin et al., 2000). The original tool is 16 items

instruments using a 4 point Likert scale (1 = not confident at all, to 4 = very confident) one item (number 4: sitz bath use) was deleted,- as it was not relevant for use in Bangladesh context. Thus, a total 15 items remained. Scores were added to obtained a total score (possible range: 15-60). A higher score indicated higher levels of postpartum self-efficacy. Cronbach's alpha was .90 in Shin's (2000) study, .89 in Lee's (2003) study, and in this study Cronbach's alpha ranged from .33 to .93 across the three time points.

6. Postpartum Care Knowledge

Postpartum care knowledge was measured by modifying the Postpartum Self-care Knowledge scale (Park et al., 2003). The original tool consisted of 20 items, with Yes / Don't know /No response. One item about sitz bath knowledge was deleted as it was inappropriate in the Bangladesh context. Only correct answers received a score and scores for the 19 items were added to obtain a total score (possible score range 0-19). Higher scores indicated high level of postpartum care knowledge. The KR-20 of this instrument in the original study was .76 at pretest and for posttest .73 (Park et al., 2003). For this study KR-20 ranged from .55 to .85 across the three time points.

Personal characteristics

Personal characteristics consisted of socio-demographic characteristics and delivery-related characteristics

7. Socio-demographic characteristics

Maternal socio-demographic characteristics were measured by a questionnaire consisting of 5 items including age, highest educational level, living status, occupation, and monthly family income. These were developed by the researcher based on review of the literature.

8. Delivery-related characteristics

For delivery-related characteristics, the researcher identified 7 items including gestational age, postpartum duration, episiotomy, general condition and sex of the newborn, frequency of participation in parenting preparation class, and numbers of antenatal visits. This information was recorded from the charts.

Aside from two instruments (i.e., BIMF, EPDS) that were accessed as Bengali version, the remaining instruments were translated into Bengali based on

translation-back translation procedure following the steps provided by bilingual experts (Sperder & Devellis, 1994). First, the original English version was translated into the Bengali by a Bangladeshi bilingual translator. Second, the Bengali version was independently back-translated into English by another Bangladeshi bilingual translator. Finally, the two English versions were compared by an English lecturer of Moulana Vashani College, Sirajgonj, to check for appropriate meaning and to ensure the equivalence of the two versions. In addition, an obstetrician also checked the final questionnaires.

D. Data Collection Procedures

Following the Institutional Review Board (IRB) approval and obtaining approval and cooperation of the local authorities, data were collected by the researcher with help from two local Research Assistants (RA), from May to December, 2017. There were three points of data collection: 1) pre-test between the first day following childbirth to < 1week postpartum in the hospital ward,- 2) posttest- 1, 2 weeks postpartum, by mail-, and 3) posttest 2, 6 weeks at the Expanded Program of Immunization (EPI) center, when the mothers came to vaccinate the infant. Both RAs were clinical nurses working at the Dhaka Medical College Hospital,

with masters degrees and were experience in data collection. Instructions were provided to R/As about the data collection process by the researcher via face-to-face communication. Maintaining confidentiality, avoiding potential manipulation in filling out the questionnaire, and providing ample time for any questions raised by participants, were emphasized. The schedule for data collection and provision of postpartum self-care intervention are shown in Table 2.

Table 2. Data Collection and Provision of Nurse-led Postpartum Self-care Intervention

PP Day 1	PP Day 2	PP Day 3	PP Day at 2wks	PP Day at 2wks	PP Day at 4wks	PP Day at 6wks
Pretest	Intervention (1) Postpartum Self-care intervention in hospital		Intervention (2) via phone call 3-5ims	Posttest-1	Intervention (3) via phone 3-5ims	Post-test -2
Data collection by face to face encounter in hospital in PP ward	Session 1 1hour	Session 2 1hour	Reinforcement for 3-5 minutes	Data collection by mail	Reinforcement for 3-5 minutes	Data collection in vaccination center, face to face encounter

The process of pretest, posttest-1, and posttest-2, data collection are described as follows.

Pretest

The researcher administered the questionnaire and collected data by face to face encounter. A question was explained if mothers had difficulty understanding. Participants who preferred self-administration, were advised to drop the filled in questionnaire in a collection box which had been placed in the ward and the researcher checked for any missing items. Phone number were obtained for the

purpose of further contact. Also, the posttest 1 questionnaire was provided along with a stamped envelope and participants were requested to complete the second questionnaire and send it via mail two weeks later. The Control group received the hospital's standard care- which was 5 minute verbal instruction at the time of hospital discharge, and the intervention group participated in the NL PPSC program.

Posttest-1 (at 2 weeks postpartum)

The researcher telephone called the participants during their second postpartum week to remind them to mail the filled questionnaire. The researcher collected the mailed questionnaires or arranged visits to the participants to pick up the completed questionnaire, based on the participants' convenience. The response rate of participants was 76.4% at posttest-1.

Posttest-2 (at 6 weeks postpartum)

Posttest-2 data were collected at EPI centers at DMCH, and Mohakhali, Dhaka, by face to face encounter by the researcher and RAs. Confidentiality was maintained for follow-up data by separating contact information from actual identifying

information and data, and was used by the researcher only. A system was devised where the researcher provided participants with a green card which was marked by the same questionnaire code number used in the previous questionnaire. Participants were told to bring the green card to show the data collector RA wearing identifiable uniform at immunization centers. In this way, unnecessary exposure of personal information was avoided. Prior to the expected date of immunization, participants were telephoned to verify the date and location of posttest-2 data collection. On the day of immunization, the RA met the participant and checked the code number on the green card in order to provide the correct questionnaire. After finishing, the RA gave a gift voucher of 320 BDT (approximately 4 USD) in an envelope as a token of appreciation for participation. For the Control group, a postpartum self-care brochure was provided at the end of data collection along with gift voucher. The response rate of participants was 83.8% in posttest-2 follow-up data collection.

E. Ethical Considerations

The data were collected after receiving approval from Institutional Review Board (IRB) of the College of Nursing, Yonsei University, Korea. In addition, permission was obtained from the Director General of Nursing and Midwifery

Services (DGNMS), the Director, the Nursing Superintendent, and the participants of this study. Before obtaining consent from potential participants, the researcher explained the study purpose, described the intervention,- and the mode of participation, and explained that participation was to be voluntary and that the participants had the right to withdraw participation at any time without any risk. A code was assigned to maintain participants' confidentiality and anonymity. Confidentiality was maintained for follow-up data by separating the contact information from the data. Collected data were checked for missing items and entered into a computer with password as quick as possible. The data were kept in a secured locked cabinet, and will be maintained for 3 years, after which, collected data sheets will be destroyed by burning according to legal requirements.

F. Development of the Nurse-led Postpartum Self-care Program

The NL PPSC was developed based on the ADDIE model (Morrison et al, 2011). which is a methodological frame consisting of the following five phases: analysis, design, development, implementation, and evaluation (Figure 4). This model is the general process traditionally used by instructional designers and program developers. The literature (Doering, & Dogan, 2016) provides evidence that this model has

previously been effective in the development of postpartum self-management interventions. The process of each stage is discussed as follows.

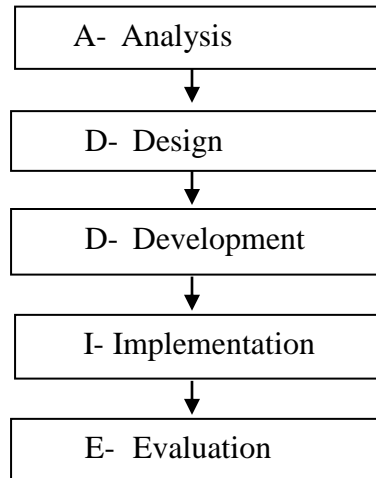


Figure 4. ADDIE model

1. Analysis Phase

This phase involves identifying related statistics and data from agencies such as WHO, UNFPA, World Bank, etc. The World Health Organization (WHO, 1998) recommended postpartum care focused on monitoring complications, such as excessive bleeding, pain, and infection, counseling of breast care and breastfeeding, advice on nutrition during breastfeeding, newborn care practice and family planning.

For newborns immediate and exclusive breast feeding, warming of infant, hygienic care of the umbilical cord, and timely identification of danger signs with referral and treatment were emphasized.

The literature was also reviewed through PubMed, CINHALL, EMBASE, Cochran DB, PsychInfo, and Google Scholars database for postpartum care needs, published in English from 2000-2017. In searching, key words such as ‘postpartum self-care intervention’ ‘postpartum self-management’ ‘postpartum education’ and ‘postpartum fatigue management’ were included. Intervention studies to promote postpartum self-care were sought especially. In addition, some classic articles were included.

The search identified 11 related articles. In this analysis, no study were found in Bangladesh, therefore others countries’ studies were reviewed. However, 3 mothers based on same inclusion criteria were asked for postpartum self-care need assessment. The findings of the articles were as follows:

Jeon and Hwang (2013) tested an educational program on pre-and postpartum self-care knowledge and efficacy of self-care. The postpartum self-care contents included by: nutrition, bathing, exercise, perineal care, sexual activities and signs for seeking medical aids. The findings stated that, the intervention was

significantly effective on postpartum self-care knowledge ($t = -2.77$; $P = <.01$) and efficacy of postpartum self-care ($t = -6.71$; $P = <.000$) which enhance postpartum mothers' quality of life. Another study (Awano, & Shimada 2010) has developed a postpartum self-care program to promote mothers self-efficacy on breastfeeding. Researcher used pamphlet and audiovisual materials, and the program implemented during hospital stay before discharge. Result reported continuation of fully breastfeeding rate significantly ($p = 0.02$) higher than control group. In the searching of using the media/procedure for provision of postpartum self-care intervention, it is found that, nurses/midwives' 'counselling', 'teaching', 'printed informations', 'home visits', and professional led 'telephone call' are the effective.

An integrative review (Barbosa et al, 2016) evaluated 24 studies regarding the use of educational technologies to encourage postpartum self-care. Result found that nurse counselling and home visits were the most recommended educational modes. A systematic review (Denis & Kingston, 2008) reported that phone call intervention by a trained individual such as maternal nurse or midwife, is beneficial to reduce postpartum depression and increasing breastfeeding and newborn care skills. In terms of effectiveness of printed educational materials (e.g., clinical guideline, booklet, brochure), various forms are beneficiary and may be used as a

part of complex intervention (Giguere et al., 2012). In this regards, Reich, Penner, and Duncan (2011) studied effectiveness of an educational booklet to increase 167 first-time mothers' postpartum safety practices. Results found the mothers who had received the educational booklet adopted more safety practice. Findings suggested that, provision of educational booklet may be recommended at early discharge from hospital to retain postpartum care information and practice self-care behavior at home.

Postpartum self-care intervention usually refers to the non-pharmacological behavioral-educational program which encourage mothers to gathered postpartum care related knowledge and efficacy to self-care behavior (Giallo et al., 2014; Nazik et al., 2013; Otilia, Teodora, and Sabina, 2008) which elevate mothers self-care and quality of life (De Oliveira et al., 2015). In terms of postpartum fatigue management self-care intervention, two RCT (Giallo et al., 2014; Dunning, 2013.) used a psycho educational intervention entitled Wide Awake Parenting. This used a self-directed written book which contained explanations on postpartum fatigue management activities, e.g., tips for charging up; energy saving; and making plan work for self. Professional telephone support to participants and home visits were also provided, so that effective fatigue management could be utilized. Another RCT (Troy &

Dalgas-Pelish, 2003a) and a non-experimental study (Varcho, Hill and Anderson, 2012) used a Tiredness Management Guide (TMG) consisting of 59 interventions including rest and relaxation, time management, rearranging usual activities, relief/prevention of hemorrhoids/constipation, signs of infection, and emotional support. These studies supported the use of psycho-educational approaches to improve postpartum self-care knowledge. Demonstration of parenting skills may be used as a component of self-care intervention. One of two studies used pilates exercises (Ashrafinia et al., 2015) and another used low-intensity exercise incorporated pilates, yoga and music (Ko, Yang, and Chiang, 2008) for fatigue management. Ashrafinia intervened pilates exercise five times a week for 30 min in each session for 8 consecutive weeks. Both of this studies reported significantly decrease physical fatigue, psychological fatigue and fatigue symptoms. Another quasi experimental study (Doering, & Dogan, 2016) used Helping U Get Sleep (HUGS) intervention which delivered 3 home visits and 4 phone calls. Treatment group received teaching on sleep hygiene, eating healthy foods, and safe infant sleep to promote their self-management postpartum fatigue. Over 9 weeks protocol, HUGS demonstrated significantly improvement of fatigue and sleep disturbance.

In terms of efficacy of postpartum depression intervention a doubled blind RCT

(Aris, 2017) used Cognitive Behavioral Therapy (CBT) on understanding postnatal depression, follow the relaxation techniques and tips to reduce stress and anxiety, positive thinking style and self-esteem, relationship with partner and infant 6 weeks periods. Participants were 4-24 weeks of postpartum mothers who had EPDS scores 12 or more. In this trial, postpartum mothers were seen by medical officer then nurse would managed them using CBT compare to control arm that used only medical officers management only. Findings showed CBT were effective to reduce postpartum depression.

To prevent postpartum depression in first-time mothers, another blinded randomized controlled trial (Phipps et al, 2013) over 6 weeks, 3 months, and 6 months of postpartum period finding showed treatment group (12.5%) was lower than control group (25%) at 6 months postpartum period. The intervention REACH (Relaxation, Encouragement, Appreciation, Communication, Helpfulness) was adolescent oriented intervention provided over course of five one-hour prenatal sessions with a postpartum booster session that includes multimedia (video snippets), interaction (role play). The content of REACH focused on developing effective communication, stress managements, baby blues vs depression, development of support system, goal settings. Each participant was given book as a guide for the didactic control program .Control

program session was group session once a week for five consecutive weeks. The intervention and control sessions were administered in similar fashion, both sessions took time 30-60 min depending on discussion.

One particular intervention study (Bagherinia, et al., 2016) was a RCT that provided 4 sessions of postpartum educational intervention. The 1st session was offered at 10-15 days postpartum individually, by face to face for 30 minutes. The next three sessions (Session 2, 3 & 4) focused on phone training and answering mothers' questions for a total of 20 minutes each. The outcome measures included maternal functioning status and self-confidence, both which increased significantly when compared to the control group. Sword & Watt, (2005) assessed the learning needs of postpartum mothers, on the limited provision of postpartum care information, training, counseling and communication that they wanted to receive from health care professionals. A review of the effectiveness of postpartum care interventions from previous studies are shown in Table 3

Following the review, interviews were conducted with three first-time postpartum mothers in Bangladesh, who were purposively selected to explore their actual needs during postpartum period. One mother had completed primary education (5 years) and the others had secondary school certificates (10 years), and

all were housewives living with their husbands only. All mothers stated that since they lacked postpartum care experience, they would like to have the aid of maternal nurses or midwives during the period following childbirth. After hospital discharge, since mothers would be far away from nurses' direct care, they were open to receiving education on postpartum self-care measures, newborn care, and watching videos before discharge. They reported that this would be helpful for new mothers to retain and practice self-care behaviors at home. For example, how to care for the episiotomy wound and protect from infection, early recovery from lochia discharge, what kinds of foods they should eat for their wellbeing and their newborn's health, how they could manage their physical tiredness, the safe timing for resuming marital sexual relationship with their husbands, and the need for family planning. For newborn care, these mothers noted need areas such as: how to care for the umbilical cord, breast feeding, protecting the newborn from illness, understanding immunizations, and the circumstances that require mother and baby to seek medical aid.

Finally, they added that to have at least one home visit, and telephone calls could bridge the connection with maternal nurse/midwives and mothers, and would be helpful to carry out effective postpartum self-care.

Table 3: Analysis of previous intervention studies for postpartum self-care

No	Author (year)	Participants and Design	Interventions		Main Outcome
			Contents and Methods	Number and Duration	
1	Jeon, and Hwang (2013)	Pregnant and postpartum women Quasi-experiment Pretest & Posttest: 22	Educational program on -pre and postpartum self-care knowledge	4 weeks –once a week for two hours	Increased pre-and postpartum self-care knowledge significantly (p=0.012) Increased self- efficacy
2	Otilia, Teodora, and Sabina (2008).	Postpartum mothers n=86 Quasi experimental study	Interview, showed image, self-care pamphlet	---	Increased self-care knowledge Pre: mean score 52.3% and post intervention 94.5%.
3	Giallo, Cooklin, Dunning, and Seymour, (2014)	Postpartum mothers. RCT Exp: 63 Cont: 67	<u>Psycho-educational intervention</u> - Professionally led telephone support - Self-directed written intervention (workbook) - Home visit	3 telephone calls Follow-up 2 weeks and 6 weeks	Increased postpartum self- care behaviors significantly. Decreased of postpartum fatigue significantly. Decrease depression - decreased anxiety - decreased stress
4	Dunning et al., (2013).	parents RCT Exp: 63 Cont: 67	WAP intervention telephone call - Self-directed written intervention (Workbook) - Home visit	telephone calls provided books	Effective in decreasing fatigue.

No	Author (year)	Participants and Design	Interventions		Main Outcome
			Contents and Methods	Number and Duration	
5	Troy and Dalgas-Pelish, (2003)	Primiparous postpartum mothers RCT Exp:32; Cont:36	The Tired Management Guidelines (TMG) - Several suggestions and techniques	2-6 weeks postpartum time	Increased postpartum self-care behaviors significantly Decreased postpartum fatigue.
6	Varcho, Hill and Anderson, 2012	Postpartum mothers Pilot study n=30	The Tired Management Guidelines (TMG) 25 suggestions and techniques	2 nd -6 th week postpartum	Decreased postpartum fatigue.
7	Ashrafinia et al, (2015).	Primiparous postpartum mothers RCT Exp: 40 ; Cont: 40	Pilates exercises 59 movement s	Five times a week 30 min /session for 8 consecutive weeks.	Decreased Postpartum fatigue during the eight weeks of follow-up. Reduced physical fatigue and mental fatigue.
8	Ko, Yang, and Chiang (2008).	Postpartum mothers Pre-post-experimental design Exp: 31 ; Cont: 30	low-intensity exercise incorporated Pilates, yoga and music	—	Significantly decrease physical fatigue, psychological fatigue and fatigue symptoms.
9	Doering, and Dogan (2016).	Early postpartum mothers Quasi-experiment Exp: 15 Cont: 11	HUGS intervention - teach sleep hygiene -teach healthy eating - teach safe infant sleep. Home visit or phone calls	Home visit lasted 60 min and 41 min, If home visit is not feasible then used phone calls	Promoted self-management of postpartum fatigue and sleep.

No	Author (year)	Participants and Design	Interventions		Main Outcome
			Contents and Methods	Number and Duration	
10	Phipps et al., (2013)	Pregnant adolescent Exp: 54 Cont: 52	REACH intervention consisted of Relaxation, Encouragement, Appreciation, Communication, Helpfulness	Five 1-hour prenatal sessions with a postpartum booster session on video snippets, role play.	Intervention effective in decreasing depression.
11	Bagherinia, Mirghafourvand, and Shafaie, (2016).	Postpartum mothers RCT Exp: 68 Cont: 68	Training sessions. Using booklets at the end. Control group used routine postpartum care provided by hospital.	1st session: 10-15 days postpartum individually face to face training for 30 min. 3 & 4 session: Phone training	Maternal functioning status and self-confidence increased significantly higher than control group.

2. Design Phase

This phase is for setting the sessions' themes, goal, specific contents and activities. A program draft was developed with the theme and goals were selected based on findings of the analysis phase. The components of the program were designed to build in the sources of self-efficacy enactive mastery, vicarious experiences, verbal persuasion, and physiological feedback (Bandura, 1977; 1994). A basic brochure containing postpartum care information was designed, to be delivered along-side to face to face discussion with interpretation of the participants' responses, using verbal persuasion. The opportunity for participants to demonstrate skills and role play how to perform, utilized enactment. The intervention period was drafted to be provided over 2 days in the hospital, during the first week following childbirth for 1 hour/day, divided into 30 minutes (to accommodate the mother's attention span to avoid fatigue). Aims were selected to provide information about the following topics: postpartum self-care measures, perineal care, how to care for the episiotomy site, sources and management of postpartum fatigue, depressive mood and maternal functioning. Discussion on postpartum self-care practices included sleeping better, resting, taking adequate nutrition, exercise, preventing infection, and seeking support for baby care. For vicarious experience as a way to promote self-efficacy, a video

format was selected, to demonstrate normal lochia vs vaginal bleeding, use of sanitary napkins, how to measure the amount of bleeding, and involution of uterus. On newborn care, the following contents was selected for inclusion: on mother-infant relationship, breastfeeding, and immunizations. Video format was again selected to provide information on umbilical cord care, change of diapers and bathing of newborn. The level of physiological responses, which is the fourth source of self-efficacy, was to be reviewed by observing the reactions and feedback from the participants. The final program consisted of face to face discussion at the first week postpartum before discharge, followed by two phone calls at the second weeks and fourth weeks to stimulate mothers to perform self-care actions and to clarify any ambiguities.

3. Development Phase

In the development phase, program content and format were reviewed by an expert panel in Bangladesh ($n = 5$) consisting of 2 physicians in obstetrics, 1 head nurse of the postpartum unit, and 2 nursing faculties in women's health nursing at a graduate school of nursing for consultation and validation. Experts were purposively selected as healthcare providers with 5-10 years of experience in maternal health

including postpartum care. The researcher explained the study purpose and asked for their review.

Panel consensus were obtained with criteria of CVI >85% for each item. The mean score of CVI was .94 (Table 4).

The researcher then revised and supplemented the program according to the experts' feedback and suggestions, and the overall NL PPSC program was finalized (Table 5).

A gift voucher (roughly 15 USD, equivalent to 1000 Bangladeshi Taka, BDT) was offered to each expert afterwards as small token of appreciation.

Table 4: Expert validity of Preliminary Nurse-led Postpartum Self-care Program

n = 5		
Categories	Components of Postpartum Self-care Program	CVI
	Goal of the session	0.95
	Duration of intervention- 2days (1 hour/day)	0.85
	Procedure: Face to face teaching and discussion; Demonstrate video clip	1.00
2nd day of PP wk-1st	Postpartum self-care- Perineal care	0.95
	Care of episiotomy site (if there was episiotomy)	0.95
	Postpartum fatigue (sign and symptoms)	0.95
	Sources and consequences of postpartum fatigue	0.95
	Postpartum self-care practice- sleeping better	0.95
	Resting	0.95
	Exercise	0.85
	Seeking medical support (for mothers and babies)	1.00
	Demonstration video clip-	1.00
	Postpartum nutrition- diet	0.95
	Prevention of constipation	0.95
	Newborn care- mother-infant relationship	0.90
	Breast feeding	0.95
	Immunization	0.95
3rd day of PP wk-1st	Umbilical cord care	1.00
	Changing of diapers	0.90
	Baby bathing	0.95
PP wk- 2nd and 4th	Phone call to perform self-care and clarify any ambiguity	0.95
Overall mean		.94

CVI= Content Validity Index

Table 5. Nurse-led postpartum self-care Program

Time	Duration and contents	
PP Day # 2 PP ward	A small group 2-3 mothers and their family members. Arrange a separate room for intervention	
	Session-1 (1 hour)	Discussion Read written information in the boucher and discuss with postpartum mothers about:
	30 mins	<ul style="list-style-type: none"> • Postpartum self-care <ul style="list-style-type: none"> - Postpartum care - Perineal care - Care of episiotomy wound
		<ul style="list-style-type: none"> • Postpartum fatigue <ul style="list-style-type: none"> - Postpartum fatigue, sign and symptoms- , sources and consequences • Postpartum self-care practice <ul style="list-style-type: none"> Sleeping better; resting, nutritional intake; exercise, prevention of infection, and seeking support for baby care.
PP Day # 3	30 min	Demonstration (video clip) Demonstrate postpartum vaginal discharge (lochia) <ul style="list-style-type: none"> - Normal vaginal bleeding / discharge (Lochia Alba, serosa, and rubra) - Use of sanitary napkins -Involution of uterus
	Session- 2 (1. hour) 30 mins	Discussion: <ul style="list-style-type: none"> -Postpartum nutrition -Prevention of constipation. Discussion

PP ward		Newborn care <ul style="list-style-type: none"> - Mother-infant relationship - Breastfeeding, immunization
	30 mins	Demonstration: Show video clip of newborn care:- <ul style="list-style-type: none"> - Umbilical cord care - Change of diapers - Baby bathing Provide brochure: before discharge
2nd Weeks PP	1st phone call	First phone call 3-5 minutes to ask and clarify self-care contents.
4th Weeks PP	2nd phone call	Second phone call 3-5 minutes to ask and clarify self-care contents. <ul style="list-style-type: none"> - Reminder to come for baby's vaccination

4. Implementation and Evaluation Phases

The implementation phase sought participant's responses and feedback on the overall program. Participants were asked about which method of teaching would be understanding for participation, allotted time needed for program, and included checking for recruitment site specifics and feasibility of larger scale program delivery.

For this purpose, a preliminary review was conducted with 2 postpartum mothers by convenience sampling at Dhaka Medical Center. The following selection criteria was applied: first-time mothers, spontaneous vaginal delivery, baby's 5 min APGAR \geq 6, postpartum duration \leq 1 week, ability to read and understand-, and willing to

participate. Exclusion criteria were mothers who delivered twin/multiple infants; severe illness due to postpartum complications, postpartum bleeding, puerperal sepsis, and psychosis; would receive newborn's vaccines other than DMCH and EPI center Mohakhali, Dhaka; and no access to telephone.

The program was given to the mothers using multimedia (laptop) and through face to face discussion. The entire program (including videos/ brochures/ questionnaires/ discussions) was delivered in the mothers tongue (Bengali) by the researcher, with accuracy of some phrases checked by a medical doctor. The researcher asked mothers about what they thought about the given self-care intervention. Both mothers expressed that they believed the program was necessary and helpful, especially for new mothers. They suggested that the program be conducted in a large space with more educational devices, such as using a model, (i.e. an artificial placenta or uterus) and to include a newborn doll etc. They also mentioned that they appreciated the video clips on newborn care and maternal care. They said that 2 days did not appear to be enough to understand all content in depth. However, based on feasibility, increasing the time was considered to be very difficult and the researcher decided to keep it as a 2 day program. A gift voucher of approximately 4 USD (equivalent to 300 BDT) was given as token of appreciation.

The final form of the NL PPSC program which was used for efficacy testing is presented in table 6. The detailed process of the program development based on the ADDIE model and evaluation, are shown in figure 5.-

Table 6: Components and Procedure of Nurse-led Postpartum Self-care Intervention

Time of intervention	Session & Duration	Contents & Procedure	Aim	Goals	Expected Outcome
PP week 1st					
Postpartum (PP) ward at the hospital before discharge	PP Day 2 30 Min	Discussion [Enactive mastery] •Read written information in the Boucher and discussed.	To provide information about -Postpartum self-care.	The mother acquired knowledge on: -Postpartum care -Perineal care -Care of episiotomy wound	-Postpartum self-care knowledge increased
		Lecture [Enactive mastery] • Postpartum fatigue (PPF)	To provide information about Postpartum fatigue (PPF)	The mother acquired knowledge on: -Postpartum fatigue -Sign & symptoms -Sources and consequences	-Postpartum fatigue was decreased
		Lecture & interpretation •Postpartum fatigue management self-care practice [Vicarious experience] [Verbal persuasion]	To provide information about the PPF management	The mother acquired knowledge and encouraged to perform PPF management: - Sleeping better - Taking resting - Taking diet - Prevention of PP infection - PP exercise - Seeking support for baby care	-PP self-care behavior was increased -Symptoms of PPF decreased

Table 6: Continued

Time of intervention	Session & Duration	Procedure	Aim	Goals	Expected Outcome
	Day 2 (cont.) 30 min	Demonstration (Show video clip) Demonstrate postpartum vaginal discharge and uterine involution. Role play [Verbal persuasion] [Vicarious experience]	To showed the postpartum care video clip to recognize by mothers normal and abnormal postpartum condition.	The mother acquired knowledge and initiate to develop practice on: - Checking postpartum vaginal bleeding (Lochia) - Identifying normal vaginal bleeding (Alba, serosa, & rubra). - Using sanitary napkin - Checking involution of uterus	Increased postpartum self- efficacy Increased postpartum self- care behavior.
	PP Day 3 30 min	Lecture Postpartum nutrition Interaction, feedback [Physiological arousal].	To provide postpartum nutritional knowledge to take balanced diet.	The mother acquired knowledge on: -Postpartum nutrition -Nutrition during lactation -Intake of more liquid food -Prevention of constipation	Increased postpartum self- care knowledge
		Lecture Newborn care	To provide knowledge about	The postpartum mother acquired knowledge on:	Increased maternal functioning in newborn care

Time of intervention	Session & Duration	Procedure	Aim	Goals	Expected Outcome
			newborn care.	<ul style="list-style-type: none"> - Mother-infant relationship - Breastfeeding, burping - Immunization 	
	Day 3 (cont.) 30 min	Demonstration Show video clip on newborn care- [Vicarious experience] [Verbal persuasion]	To develop skill on their newborns care.	<ul style="list-style-type: none"> - Mothers would visualized how to: - Provide Umbilical cord care - Change of baby's diapers - Performed Baby bathing 	Increased postpartum maternal functioning activities.
		Provide brochure: Provide a brochure before discharge.	To retained the information for postpartum self-care.	Retained postpartum self-care information through <ul style="list-style-type: none"> -Reading written information about PP care. -Retained information by reading the brochure. - perform postpartum self-care activities and newborn care 	Postpartum self-care knowledge increased.

Time of intervention	Session & Duration	Procedure	Aim	Goals	Expected Outcome
Postpartum week 2nd					
Telephone call-1st	3-5 mins	Conversation over phone call to perform self-care activities and clarify any ambiguity	To reinforcement to perform self-care activities and clarify any ambiguity if there is any.	Reinforced to perform postpartum self-care behavior.	Self-care behavior increased
Postpartum week 4th					
Telephone call-2nd	3-5 mins	Conversation over phone call to perform self-care activities	To reinforcement to perform self management activities and clarify any ambiguity in the study.	Reinforced to perform postpartum self-care behavior.	Self-care behavior increased

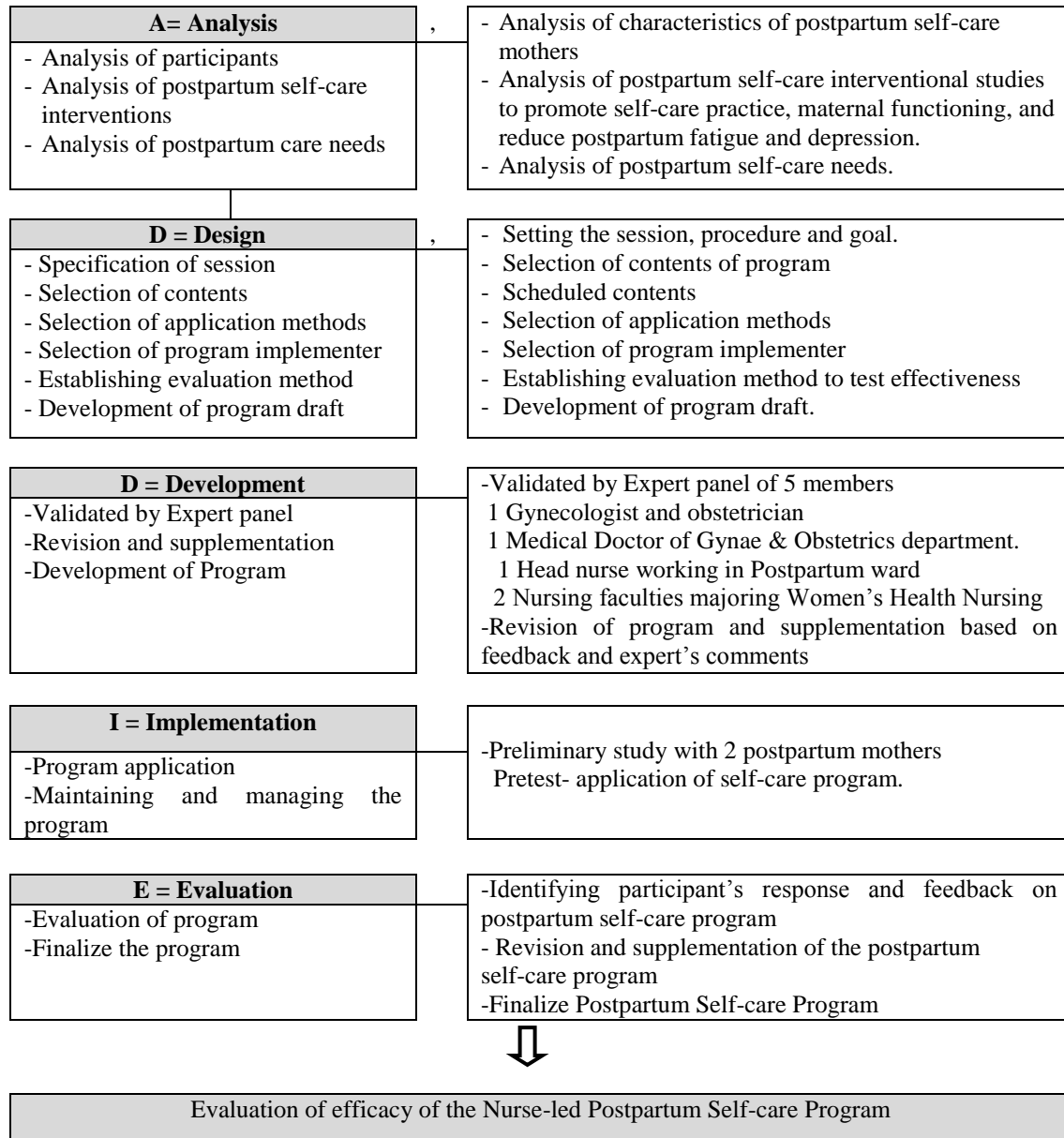


Figure 5: Development process of the Nurse-led Postpartum Self-care Program

Nurse-led postpartum Self-care Intervention

Thus, the finalized NL PPSC consisted of postpartum education in 2 sessions, and reinforcement by 2 phone calls (duration 3-5 minutes each) at postpartum 2 weeks and 6 weeks. The education sessions were to be conducted in small group format (3-5 mothers) during their hospital stay, for the duration of 1 hour in each session divided into 30 minutes separately.

G. Data Analysis

The data were analyzed by the researcher using computer software IBM SPSS statistics version 21 (SPSS Inc., Chicago, IL, USA). Demographic data were analyzed by descriptive statistics, using frequency, percentage, mean, and standard deviation. Bivariate statistics- t-test, Chi-square was used to examine homogeneity of variables, and paired sample t- test, and independent sample t-test were used to examine differences within and between groups. Since attrition rate in follow up at 2 weeks was 23.5% and at 6 weeks 16.1%, therefore the linear mixed model (LMM) was used to adjust for covariates and examine the treatment effects over three time periods. LMM was used for repeated measurements in order to explore the change in

postpartum fatigue, depressive mood, and maternal functioning between baseline and at 2 weeks; and baseline and 6 weeks while adjusting age, living status, and family income for baseline differences in the experimental and control group. The LMM is a powerful advanced statistics tool that can estimate changes over time despite missing data points of a subsample, and thus, data from all 68 participants (34 control and 34 experimental group) were included for analysis. Preliminary data were analyzed to test the assumptions of normality and homogeneity of variance using the Shapiro-Wilk criterion. The changing patterns of participants in each group over time are shown in Figure 6.

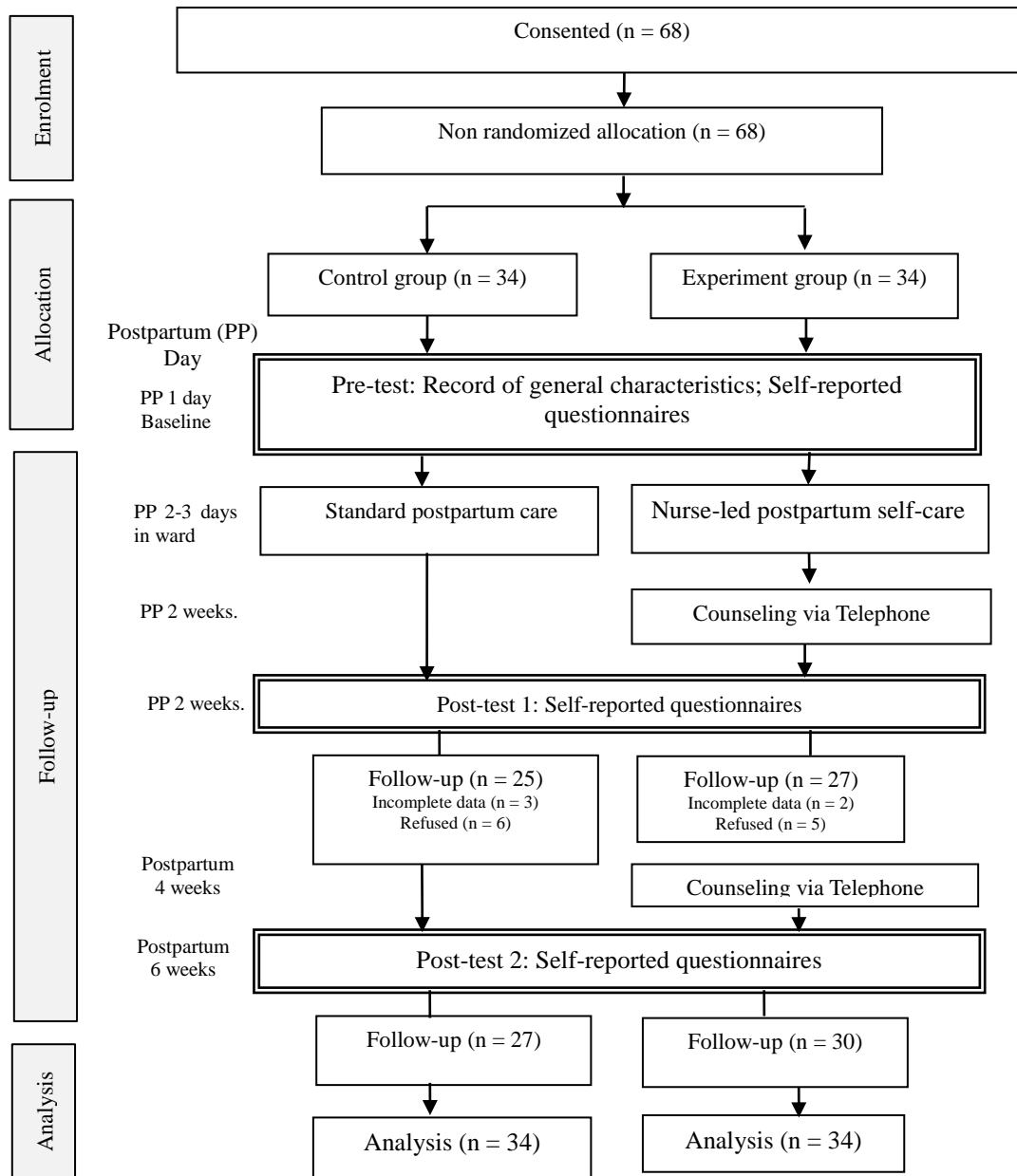


Figure 6. Flowchart of participants in this study

V. RESULTS

A. Personal Characteristics of the Sample

The socio-demographic characteristics of the sample are presented in Table 7. The average age of the participants was 20.71 years old. More than half of mothers (54.41%) had received education of 10 years and more, lived with their husbands without extra family members (61.76%), and did not work out of the home (85.29%). Monthly family income averaged 25,155 Bangladeshi currency BDT (approximately 300 USD). In the homogeneity testing, maternal age ($t = 2.90$; $p = <.01$), their living status ($\chi^2 = 3.98$; $p = <.05$), and monthly family income ($t = -2.38$; $p = <.01$), in baseline were significantly different between the experiment and control groups. The experimental group was slightly older, and more participants tended to live with their husband including other family members. They also showed slightly higher income compared to the control group.

Delivery related characteristics of postpartum mothers showed that average gestational age at delivery was 37 weeks, and the average postpartum duration was 1.4 days. The majority of them reported episiotomy (82.35%), male newborn (54.41%), with generally good conditions by APGAR scores of 7 and more (92.64%).

Regarding participating in parenting preparation class, nearly half (47%) of them received at least one parenting preparation class and all had received at least one antenatal care (ANC) visit. Among participants who had received ANC, three visits, the minimum number recommended by WHO, were most commonly reported by more than half (52.94 %). In the homogeneity testing, there were no differences in delivery related information between the experimental and control group (Table 8).

Table7. Homogeneity testing for socio-demographic characteristics

Characteristic s	Categories	Total N=68	Exp (n=34) n (%)	Cont (n=34) n (%)	t or χ^2	p
Age		20.71 \pm 2.56	21.61 \pm 3.13	19.82 \pm 2.00	2.90	.005
Education (Years)	Primary	31 (45.59 %)	16 (47.10%)	15 (44.10 %)	1.0	.60
	Secondary	26 (38.23 %)	14 (41.20 %)	12 (35.30 %)		
	Higher secondary	11 (16.18 %)	4 (11.70 %)	7 (20.60%)		
Living status	With husband only	42 (61.76 %)	17(50.0 %)	25 (73.54%)	3.98	.046
	With other family also	26 (38.23%)	17(50.0 %)	9 (26.46%)		
Occupation	House wife	58 (85.29%)	27 (79.40%)	31 (91.20%)	1.87	.17
	Working outside	10 (14.71%)	7 (20.60%)	3 (8.80%)		
Income (thousand BDT)*	M \pm SD	25.15 \pm 8.88	27.73 \pm 9.35	22.58 \pm 8.41	-2.38	.02

Exp = experimental group; Cont = control group

*100 USD=8000 BDT approximately

Table 8. Homogeneity testing for delivery-related characteristics

Characteristics	Categories	Total N = 68	Exp (n =34) n (%)	Cont (n= 34) n (%)	t/x ²	p
Episiotomy	Yes	56 (82.35%)	29 (85.30 %)	27 (79.40%)	.40	.52
	No	12 (17.65%)	5 (14.70 %)	7 (20.60%)		
Gestational age	M ± SD	37.16 ± .98	37.09 ± .99	37.24±.98	.61	.54
PP duration	M ± SD	.45 ± .50	1.47 ± .50	1.44 ± .50.81	-24	.81
General condition of newborn (APGAR)	Fair – score ≤ 7	5 (7.35 %)	2 (5.90 %)	3 (8.80 %)	1.49	.47
	Good- score 8	33 (48.53 %)	19 (55.90 %)	14 (41.20 %)		
	Very good- score > 8	30 (44.12 %)	13 (38.20 %)	17 (50.00%)		
Sex of newborn	Female	31 (45.59 %)	15 (44.10%)	16 (47.10%)	.05	.80
	Male	37 (54.41 %)	19 (55.90 %)	18 (52.90 %)		
Participation in parenting class	None	36 (52.94 %)	15 (44.10 %)	21 (61.80 %)	2.19	.33
	One	29 (42.65 %)	17 (50.00 %)	12 (35.30%)		
	Two	3 (4.41 %)	2 (5.90%)	1 (2.90%)		
ANC visits	One -Two	6 (8.82 %)	1 (2.94%)	5 (14.70%)	3.24	.35
	Three	36 (52.94 %)	20(58.82%)	16 (47.10%)		
	Four & More	26 (38.24 %)	13 (38.24%)	13 (38.20%)		

Exp = experimental group; Cont = control group

B. Homogeneity Testing of Process Indicators and Outcome Indicators

The process indicators at baseline, postpartum self-care (possible score range: 18-126) was at moderate level in both the experimental ($M = 80.53$; $SD = 4.48$) and control groups ($M = 81.53$; $SD = 6.03$). Postpartum self-efficacy was also at moderate level in both groups (experimental $M = 23.65$, $SD = 2.79$ and control $M = 24.50$, $SD = 2.13$) from a possible range of 15-60. Postpartum care knowledge, among the possible score range of 0-19, both experimental ($M = 5.41$; $SD = 2.83$) and control group ($M = 6.03$; $SD = 2.64$) showed low level of knowledge. Homogeneity testing found that both groups were similar before providing intervention (Table 9).

Table 9. Homogeneity testing of process indicators

Variables	Possible scores	Baseline		<i>t</i>	<i>p</i>
		Exp (<i>n</i> = 34) <i>M</i> ± <i>S</i>	Cont (<i>n</i> = 34) <i>M</i> ± <i>S</i>		
PP self-care	18-126	80.53 ± 4.48	81.53 ± 6.03	.77	.44
PP self-efficacy	15-60	23.65 ± 2.79	24.50 ± 2.13	1.41	.16
PP care knowledge	0-19	5.41 ± 2.83	6.03 ± 2.64	.93	.35

Exp = experimental group; Cont = control group

The result of outcome indicators at baseline are presented in table 10. For baseline postpartum fatigue, among possible score range of 10- 40, both the experiment ($M = 26.32$; $SD = 3.21$) and control groups ($M = 24.68$; $SD = 3.18$) showed a moderate level. In homogeneity test, the experiment group showed statistically significantly higher fatigue ($t = -2.17$; $p = <.05$) compared to the control group. Using a cutoff of ≥ 13 , we found a sizable proportion with depressive mood in both the experimental (33.3%) and control group (29.6%), although there were no statistically significant differences ($\chi^2 = -.29$; $p = .76$). The level of PP maternal functioning was slightly less than midpoint, and PP maternal functioning was not significantly different between the groups.

Table 10. Homogeneity testing of outcome indicators

Variables	Possible scores	Baseline		<i>t</i>	<i>p</i>
		Exp (n=34) $M \pm S$	Cont (n=34) $M \pm S$		
PP fatigue	10-40	26.32 ± 3.21	24.68 ± 3.18	-2.17	.03
Depressive mood	0-30	11.74 ± 3.44	10.97 ± 3.54	-.90	.37
	≥ 13	10 (33.3%)	8 (29.6%)	-.29	.76
Maternal functioning	0-120	54.03 ± 6.08	52.38 ± 7.95	-.95	.34

Exp = experimental group; Cont = control group

C. Differences in Process Indicators over time

Over the three time periods, differences of process indicators, i.e., PP self-care PP self-efficacy, and PP care knowledge were analyzed using paired sample t-test and independent t test to examine differences within and between the control and experiment groups presented in tables 11 to 12 and figures 7 to 9.

Differences from baseline to 2 weeks

The process variables, postpartum self-care, postpartum self-efficacy, and postpartum care knowledge are conceptually meaningful for effects on the output variables. Findings showed that within the experimental group between baseline and PP 2weeks, all variables showed significant improvement, while for the control group, only postpartum self-efficacy was improved ($t = -9.08$, $p = <.01$). For between group differences at postpartum 2 weeks, postpartum self-care ($M_{dif} = 10.98$; $t = 9.49$; and p value = $<.01$), postpartum self-efficacy ($M_{dif} = 17.18$; $t = 18.30$; and p value = $<.01$) and postpartum self-care knowledge ($M_{dif} = 8.76$; $t = 11.08$; and p value = $<.01$) of the experiment group were significantly higher compared to the control group (Table 11).

Table 11. Differences of process indicators within and between the control and experimental groups at baseline and 2 weeks postpartum

Variables	Groups	Baseline Exp: 34 Cont: 34	2 Weeks Exp:27 Cont: 25	<i>t (p)^a</i>	Mean diff	<i>t (p)^b</i>
		M ± SD	M ± SD			
Self-care	Exp	81.07 ± 4.18	92.78±2.81	-13.98 (.000)	10.98	9.49 (.000)
	Cont	81.40 ± 6.04	82.12 ± 4.02	-.90 (.37)		
PP self-efficacy	Exp	23.93± 2.98	46.07±2.80	-29.58 (.000)	17.18	18.30 (.000)
	Cont	24.84± 2.03	29.80±2.70	-9.08 (.000)		
PP care knowledge	Exp	5.74 ± 2.65	15.15 ± 2.19	-13.62 (.000)	8.76	11.08 (.000)
	Cont	6.20 ± 3.01	6.84 ± 3.11	-1.65 (.111)		

Exp = Experimental; Cont = Control; a =Paired sample t-test; b=Independent sample t-test; Significance .level: p < .05

Differences from baseline to 6 weeks

From baseline to 6 weeks postpartum, the experimental group showed significantly greater differences ($p = <.01$) compared to the control group (Table 12). For within group differences, there were significant mean differences in all three variables for both the experimental and control groups: For example, the experimental group's postpartum self-care ($M_{dif} = 15.28$; $t = 10.02$; and $p = . <.01$), postpartum self-efficacy ($M_{dif} = 15.04$; $t = 19.72$; and $p = <.01$) and postpartum care knowledge ($M_{dif} = 5.82$; $t = 6.91$; and $p = <.01$) levels all improved by 6 weeks. The same pattern was found for the control group, which may suggest that by 6 weeks after childbirth, a natural improvement is likely for mothers in general.

Table 12. Differences of process indicators within and between control and experimental groups at baseline and 6 weeks postpartum

Variables	Groups	Baseline	6 weeks	$t(p)^a$	Mean diff	$t(p)^b$
		(Cont:27 Exp:33)	(Cont:27 Exp:30)			
		M \pm SD	M \pm SD			
PP self-care	Experiment	80.70 \pm 4.52	109.77 \pm 3.15	-27.73 (.000)	15.28	10.02 (.000)
	Control.	81.30 \pm 5.82	95.07 \pm 3.36	-12.42 (.000)		
PP self-efficacy	Experiment	23.90 \pm 2.83	52.83 \pm 1.80	-54.87 (.000)	15.04	19.72 (.000)
	Control.	24.59 \pm 2.15	38.48 \pm 2.53	-25.23 (.000)		
Postpartum care knowledge	Experiment	5.80 \pm 2.68	14.40 \pm 1.86	-15.12 (.000)	5.82	6.91 (.000)
	Control.	6.15 \pm 3.01	8.93 \pm 2.36	- 4.45 (.000)		

Exp = experimental group; Cont = control group; a =Paired sample t-test; b=Independent sample t-test;
Significance .level: $p < .05$

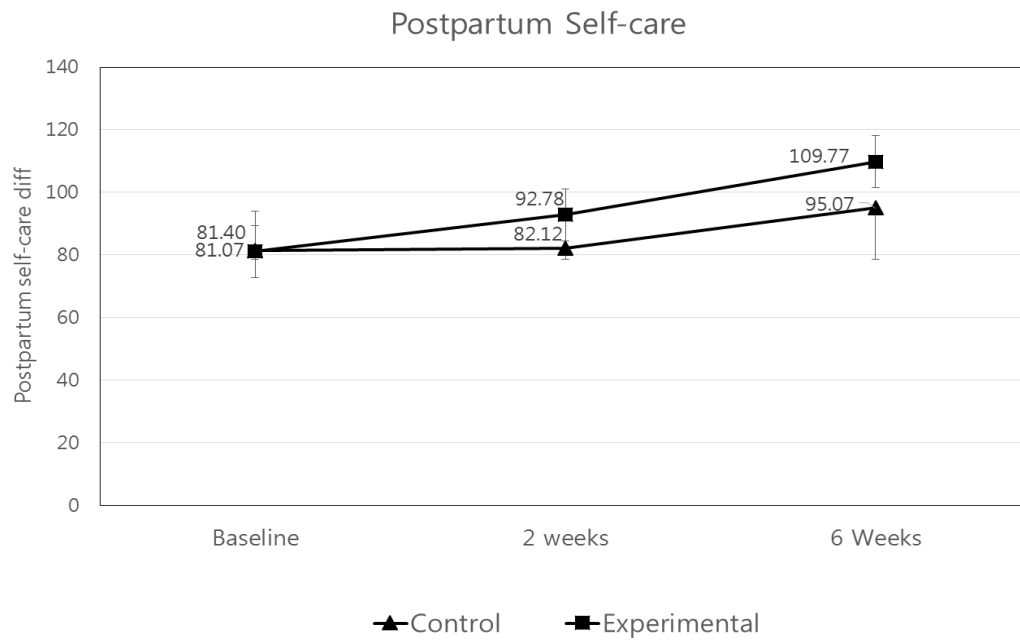


Figure 7: Differences of postpartum self-care between the groups

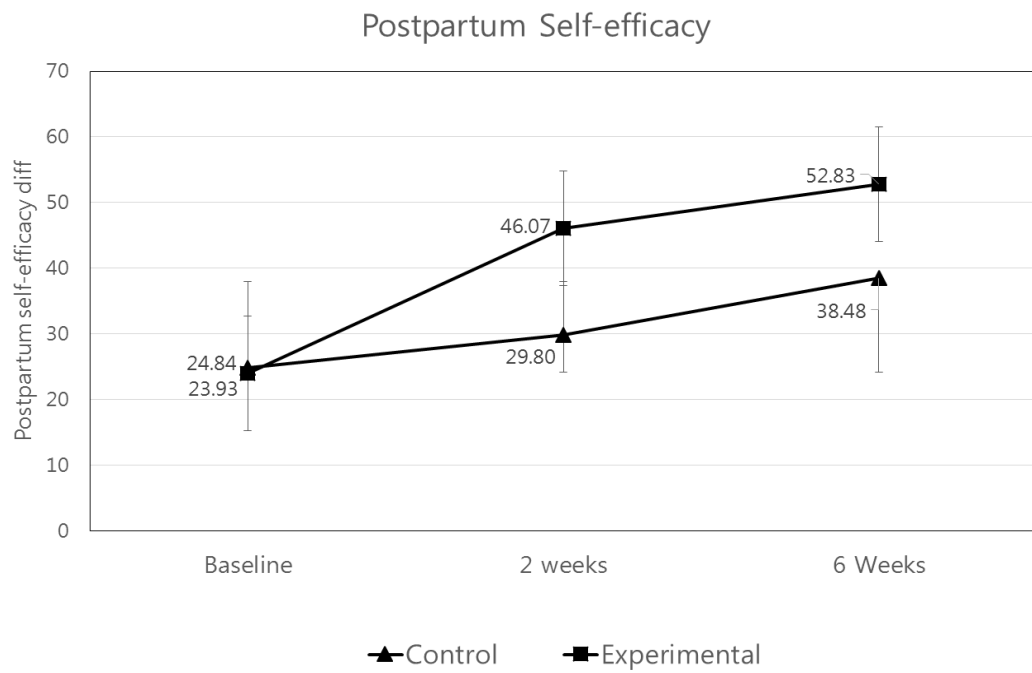
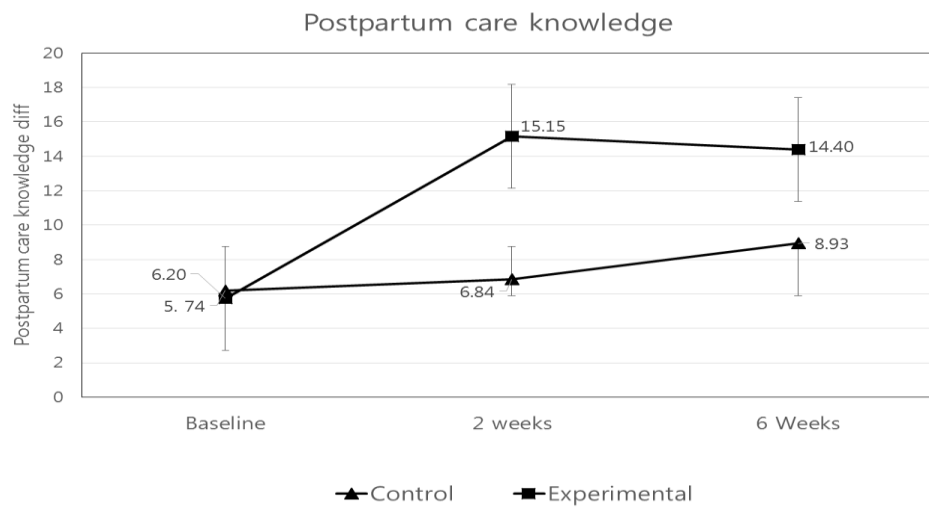


Figure 8: Differences of postpartum self-efficacy between the groups



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Figure 9: Differences of postpartum care knowledge between the groups

D. Descriptive statistics for the outcome indicators

Changes in the main variables over the three measurement points are presented in table 13 and figures 10 to 12. Fatigue and depressive mood showed a general trend of decrease between PP 2 to 6 weeks. In intervention group, the depressive mood cutoff score ≥ 13 at baseline found 33%, over 3 time point at 6weeks, all mothers in NLPPSC group reported below than cutoff. Maternal functioning also showed a general trend of increase between PP 2 to 6 weeks.

Table 13. Postpartum fatigue, depressive mood, and maternal functioning of Experiment and Control groups over time

Variables	Groups	Baseline (Exp:34 Cont:34)	2 Weeks (Exp:27 Cont:25)	6 Weeks (Exp:30 Cont:27)
		M \pm SD	M \pm SD	M \pm SD
Postpartum fatigue	Exp	26.32 \pm 3.21	25.81 \pm 2.35	19.57 \pm 2.71
	Cont	24.68 \pm 3.01	25.00 \pm 1.84	23.52 \pm 3.01
Depressive mood Mean score	Exp	11.74 \pm 3.44	11.93 \pm 2.98	7.87 \pm 2.50
	Cont	10.97 \pm 3.54	11.56 \pm 3.47	9.74 \pm 3.98
	≥ 13 Exp	10 (33.3%)	8 (29.6%)	0 (0.0%)
	Cont	8(29.6%)	7(28.0%)	9 (33.3%)
Maternal functioning	Exp	54.03 \pm 6.08	74.70 \pm 5.59	94.60 \pm 6.32
	Cont	52.38 \pm 7.95	65.84 \pm 7.20	77.85 \pm 7.17

Exp = experimental group; Cont = control group

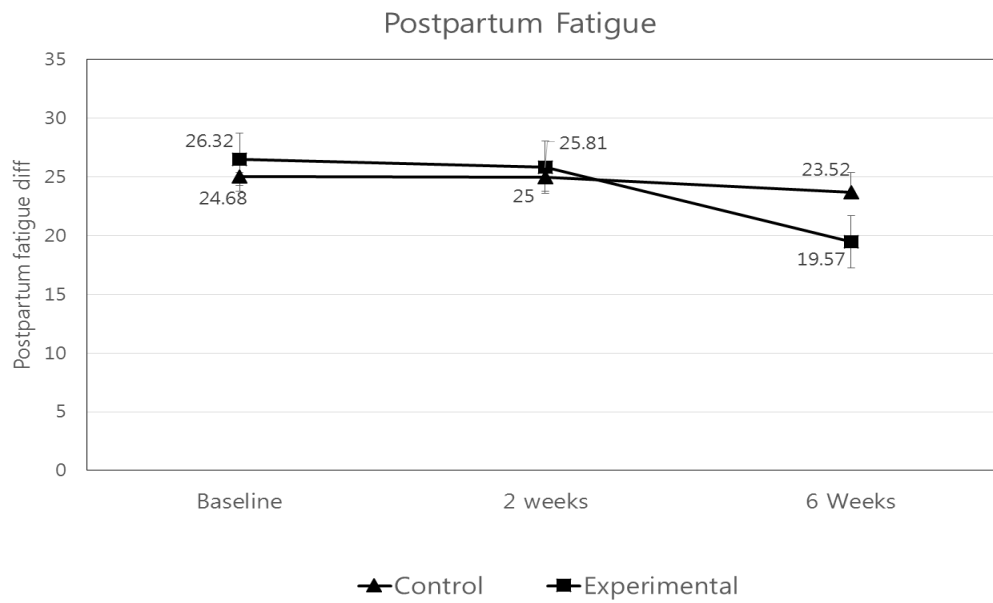


Figure 10: Differences of postpartum fatigue between the groups

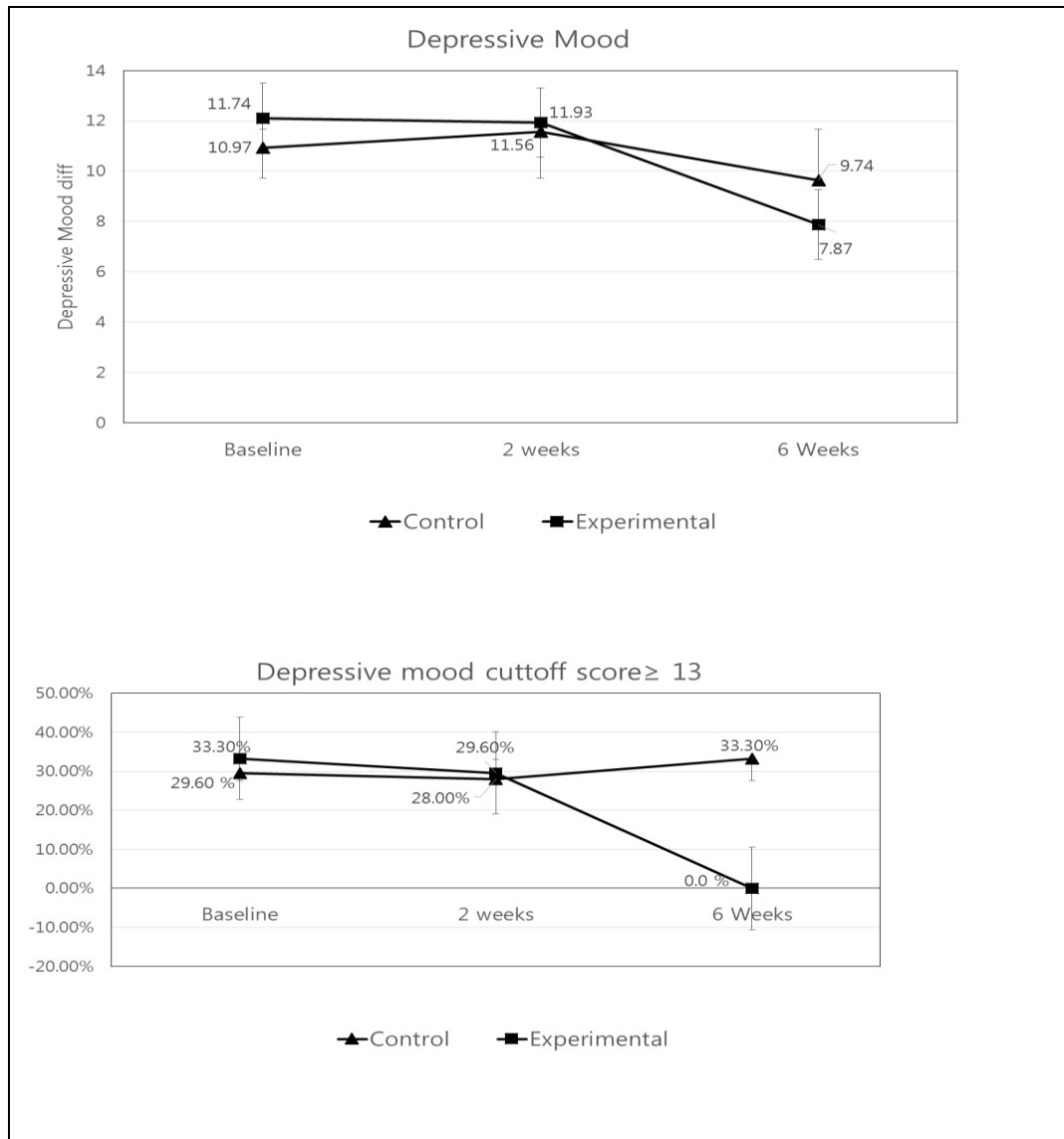


Figure 11: Differences in postpartum depressive mood between the groups

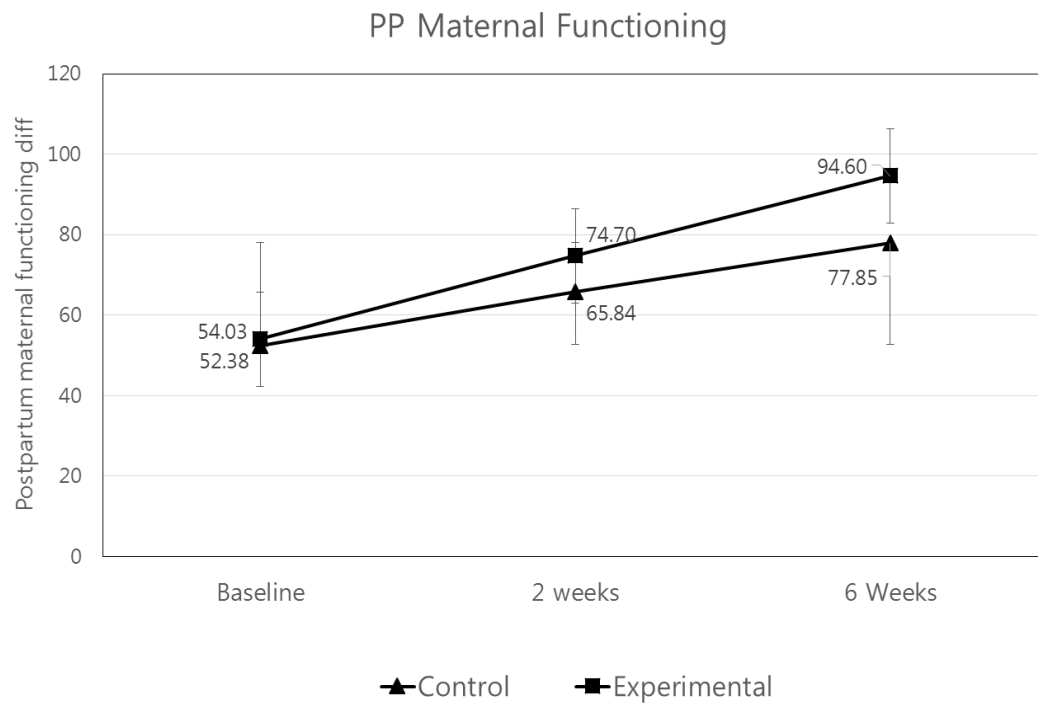


Figure 12: Differences in postpartum maternal functioning between the groups

E. Effectiveness of the Intervention over time

For the LMM analysis to test the effectiveness of NL PPSC intervention on postpartum fatigue, depressive mood, and postpartum maternal functioning, the covariates that showed statistical significance, i.e., maternal age, living status, and monthly income, were adjusted in the equation. In addition, conceptually meaningful variables of this study, i.e., postpartum self-care behavior, postpartum self-efficacy, and postpartum self-care knowledge were also loaded as covariates. The LMM findings of the outcome indicators, i.e., postpartum fatigue, depressive mood, and postpartum maternal functioning, are shown as follows.

Effects on postpartum fatigue

The mothers who received the NL PPSC intervention showed statistically significant levels of slightly higher fatigue ($\beta = 1.45$; $SE = .72$; $t = 1.98$; and $p = . <.05$) over time when compared to the control. However, the treatment effects of NL PPSC intervention group at 6 weeks postpartum was statistically significant in decreased fatigue ($\beta = -6.17$; $SE = 1.81$; $t = -3.39$; and $p = <.01$) compared to the control group (Table 14).

Table 14. Estimated effects of the Nurse-led Postpartum Self-care Intervention on
postpartum fatigue

Parameter	Estimate	Std. Error	t	Sig
Intercept	22.71	5.21	4.36	.000
Age	-.16	.09	-1.64	.104
Living with husband only (ref: Living with family also)	-.23	.44	-.52	.601
Family income	-4.06	2.62	-.015	.988
Self-care behavior	.08	.05	1.69	.092
PP self-efficacy	-.05	.08	-.66	.508
PP self-care knowledge	.02	.08	.25	.796
Experiment group (ref: control)	1.45	.72	1.98	.048
PP 2 Weeks (ref: baseline)	.47	.83	.56	.573
PP 6 weeks (ref: baseline)	-1.66	1.52	-1.08	.279
PP 6 weeks * Experiment (ref : PP 6 weeks * control)	-6.17	1.81	-3.39	.001
PP 2 weeks * Experiment (ref : PP 2 weeks * control)	-.99	1.94	-.50	.611

PP = Postpartum

Effects on depressive mood

The estimated treatment effects did not find significant changes related to the NL PPSC intervention for depressive mood compared to the referent group (Table 15).

Table 15. Estimated effects of the Nurse-led Postpartum Self-care Intervention on depressive mood

Parameter	Estimate	Std. Error	t	Sig
Intercept	15.77	5.87	2.68	.008
Age	.136	.145	.93	.353
Living with husband only (ref: Living with family also)	-.88	.70	-1.26	.212
Family income	-7.39	4.08	-1.80	.075
Self-care behavior	-.06	.05	-1.31	.191
PP self-efficacy	.004	.08	.05	.960
PP self-care knowledge	.06	.08	.80	.420
Experiment group (ref: control)	1.55	.89	1.74	.085
PP 2 Weeks (ref: baseline)	.67	.71	.94	.348
PP 6th weeks (ref: baseline)	-.51	1.46	-.35	.725
PP 6 weeks * Experiment (reff : PP weeks * control)	-2.29	1.71	-1.33	.183
PP 2 weeks * Experiment (ref : PP 2nd weeks * control)	-.60	1.84	-.32	.743

PP = Postpartum

Effects on postpartum maternal functioning

For postpartum maternal functioning, the estimated treatment effects showed that living with husband but not with other family members, was statistically significant ($\beta = 4.44$; $SE = 1.30$; $t = 3.39$; $p = <.01$) compared to women who also lived with other family members. Among other variables, more postpartum self-care knowledge was also statistically significant ($\beta = .37$; $SE = .18$; $t = 2.03$; $p = <.05$) for maternal functioning for the NL PPSC participants. Maternal functioning at both 2 weeks ($\beta = 12.76$; $SE = 1.55$; $t = 8.20$; $p = <.01$) and 6 weeks ($\beta = 24.54$; $SE = 3.12$; $t = 7.84$; $p = <.01$) showed statistically significant improvement over time.

Finally, the treatment effects at 6 weeks were statistically significant ($\beta = 13.72$; $SE = 3.67$; $t = 3.73$; $p = <.01$) in increased maternal functioning in the experimental group compared to the control group (Table 16).

Table 16. Estimated effects of the Nurse-led Postpartum Self-care Intervention on postpartum maternal functioning

Parameter	Estimate	Std. Error	t	Sig
Intercept	37.20	11.96	3.11	.002
Age	.45	.27	1.66	.102
Living with husband only (ref: Living with family also)	4.44	1.30	3.39	.001
Family income	2.88	7.62	.37	.707
Self-care behavior	-.04	.10	-.39	.690
Postpartum self-efficacy	.006	.17	.03	.971
PP self-care knowledge	.37	.18	2.03	.044
Experiment group (ref: control)	1.62	1.74	.93	.354
PP 2 Weeks (ref: baseline)	12.76	1.55	8.20	.000
PP 6th weeks (ref: baseline)	24.54	3.12	7.84	.000
PP 6 weeks * Experiment (ref : PP 6 weeks * control)	13.72	3.67	3.73	.000
PP 2 weeks * Experiment (ref : PP 2 weeks * control)	4.74	3.94	1.20	.231

PP = Postpartum

VI. DISCUSSION

This section describes the effectiveness of the NL PPSC Intervention followed by its development and implications for nursing practice and research in Bangladesh.

A. Effectiveness of the NL PPSC Intervention

Findings of the efficacy test of the NL PPSC showed that the process indicators, postpartum care knowledge, postpartum self-efficacy, and postpartum self-care behavior, significantly increased among mothers who participated in the intervention group. Among the outcome indicators, postpartum fatigue and maternal functioning were effectively influenced by this intervention. As there were no intervention studies found yet in Bangladesh to directly compare with this study, therefore studies from others countries were compared in the following discussion.

Effects on postpartum fatigue

Findings of this study showed that fatigue decreased over time in the experimental group compared to the control. Among the time points (within two days after delivery, PP 2 weeks, and PP 6 weeks), the decrease in fatigue at PP 6 weeks was statistically significant in the experimental group. This finding is similar with previous

studies that used a psycho-educational approach to manage PP fatigue with a randomized control trial (RCT) design. For example Wide Awake Parenting (WAP) used a self-directed written booklet describing fatigue management actions that the mother could read and follow at home, and nurse-led telephone support (Dunning et al., 2013). Similarly, another RCT (Giallo et al 2014) used WAP and provided a fatigue management booklet and professional-led telephone between 4 weeks to 2 months. Both studies encouraged mothers to prioritize their tasks, and plan for and engage in postpartum self-care behaviors. Results found a significant effect on postpartum self-care behavior. Giallo's study (2014) also promoted self-care behavior and decreased fatigue levels.

The Tired Management Guideline (TMG) is another psychoeducational approach used to manage postpartum fatigue (Troy & Dalgas-Pelish, 2003a). Sixty-eight first-time mothers participated in a nurse-led self-care guide developed by author. The TMG included 59 interventions for mothers at postpartum 2nd to 6 weeks, and described 8 potential sources of postpartum fatigue and the actions to manage. Examples included rest and relaxation, time management, and rearranging usual activities. Another pilot study (Varcho, Hill & Anderson, 2012) also used the (TMG) for postpartum mothers at 2 to 6 weeks, including rest and relaxation, time

management, and rearranging usual activities. Both of these studies were effective in decreasing fatigue. This study also used a nurse-led approach, which included opportunity for face-to-face lecture, discussion on postpartum self-care, and follow up phone calls, that may have been helpful in clarifying and supporting mothers' needs about maternal self-care performance. As such, these studies support the utility of psychoeducational approaches for new mothers in decreasing postpartum fatigue, in both Western countries and Bangladesh.

Although this study found statistically significant improvement in self-efficacy at PP 2 weeks and PP 6 weeks in the NL PPSC group, LMM analysis did not find direct influences of self-efficacy for fatigue. This suggests indirect effects of self-efficacy on fatigue, which may need to be further explored in future studies. This study found a mid-level of fatigue at baseline. Although using a different measurement of fatigue, a prior survey of new mothers in Bangladesh reported a lower mean fatigue score (Khatun et al., in press). This may be related to measurement time or differences in sample characteristics, but further studies are needed to clarify.

Effects on depressive mood

In this study, the NL PPSC intervention was not statistically significant in decreasing depression scores, when treated as a continuous variable. This finding is similar to a RCT study of a nurse-led postpartum discharge education program to reduce postpartum depression, which did not find differences at 6 weeks nor at 3 months (Ho et al., 2009). In contrast, Giallo's study (2014), used WAP with a fatigue management booklet, a home visit, and three telephone support sessions led by a professional, and was effective in decreasing postpartum depression after 6 weeks. Differences might be due to the intensity and number of contacts, as the NL PPSC did not include home visits and had one less telephone contact.

Another RCT with first-time mothers (Phipps, Raker, Ware, & Zlotnick, 2013) used REACH (Relaxation, Encouragement, Appreciation, Communication, Helpfulness) an intervention that was an adolescent-oriented adaptation of an Interpersonal Therapy (IPT) targeting postpartum depression and initiated from the prenatal period. REACH provided a total of five sessions, 1 hour each, that was started from prenatal to postpartum periods and included video snippets, role play, content focused on effective communication, stress managements, baby blues vs depression, development of support system, and setting goals. Each participant received 30-60

minutes discussion, a book as a guide for instruction over 6 weeks, 3 months, and 6 months. Findings did not specify effects at 6 weeks, but reported that the treatment group (12.5%) had lower depression than the control group (25%) at 6 months postpartum. This suggests the possibility that NL PPSC participants may have shown effects over a longer period of time, assuming continued practice of self-care.

The EPDS originally proposed a cutoff of 12 or 13 (Cox et al., 1987) and same score was used in a previous study of Bangladesh mothers (Gausia et al., 2007). As depression might be stigmatized due to cultural attitudes in Bangladesh (William, Sarker, & Ferdous, 2017), a cutoff score of 13 or over in this study. Using this cutoff, this study found a high proportion of mothers with PP depression (33% in the intervention group). at baseline, i.e., 2-3 days within delivery. Of these mothers, 82.4% had received an episiotomy, which may be related to their perception of fatigue. At 6 weeks, the control group showed a high proportion of PP depression (9 mothers with scores ≥ 13 , 33%), much higher than 9% reported by Gausia and colleagues' (2007) study among women at 6-8 weeks postpartum in Bangladesh. This may be due to demographic differences in the two studies, i.e., Gausia's study involved 100 multiparous postpartum mothers mean age 25.5 years. Among them 54% mothers had child 1, 34 % had 2 and remaining 12 % mothers had 3 or more. Whereas this study

mostly included young first-time mothers may cause more depressive mood.

When analyzing PP depression based on cut off categories, the pattern of PP depression over the three time points (up to 6weeks) in mothers in the NL PPSC group steadily decreased, resulting in none at ≥ 13 levels at 6 weeks, which is in contrast to the pattern of increased depression in the control group over time (33% at ≥ 13 levels at 6 weeks). Future studies are needed to employ the NL PPSC program with more contact intensity and may be needed to be followed up for longer periods, to more accurately manage depressive moods of new mothers in Bangladesh.

Effects on maternal functioning

In maternal functioning, maternal age and family income had a statistically significant association with increased maternal functioning. Women living with their husband only, reported significantly higher maternal functioning than women also living with other family members. As it happens that after childbirth in Bangladesh, other relatives will often come to support the new mother or she will stay at her parents' home for some time to aid postpartum recovery, the postpartum living status may temporarily change. Thus, usual living status may not offer clear understanding of how it may be related to postpartum maternal functioning. The process indicator postpartum self-care

knowledge was statistically significantly associated with increasing maternal functioning over time. The intervention was significantly effective in increased maternal functioning at 2 weeks and also at 6 weeks follow-up. These findings may be related to some reasons. The NL PPSC intervention introduced mothers to specific postpartum self-care knowledge, such as understanding normal vaginal discharge, perineal wound care, pelvic floor exercise, breastfeeding, and so on. Telephone counseling at 2 weeks also supported mothers' needs about maternal self-care performance. Finally, providing a brochure which contained information on actions to achieve self-care activities may have all been beneficial. The beneficial effects on maternal functioning are supported by findings from the literature. For example, a postpartum educational intervention for first-time mothers consisting of 4 sessions and phone calls found improvement in maternal functioning status and self-confidence after 8 weeks (Bagherinia, Mirghafourvand & Shafaie, 2016). In addition, another study (Birkin et al, 2010) found that postpartum knowledge and efficacy influenced maternal functioning.

Effects on process indicators

For the process indicators, self-care behavior, self-efficacy, and PP care knowledge showed statistically significant increases at both 2 weeks and 6 weeks PP,

compared to baseline levels. This finding is similar to studies such as a nurse-led postpartum self-care intervention for primiparas (Oleiwi, & Ali, 2010) and a prenatal and postnatal self-care educational program focused on perineal care, nutrition, and sexual activities (Jeon & Hwang, 2013), which found improvement in postpartum self-care knowledge and self-care efficacy.

Overall, the participants in this study were young age (average 20.71 years) and had completed primary to secondary level education (83.82%), which may have helped them to understand better the NL PPSC content. In addition, as the majority of the mothers (85.29%) did not work out of the house they may have had sufficient time to perform self-care behaviors at home.

As such, this NL PPSC intervention offers implications for nursing practice, theory development, and research. In practice, maternal nurse caring for new mothers in Bangladesh should provide psycho-educational support using strategies for fatigue management before hospital discharge. Although brief, the NL PPSC was influential in improving the process indicators and improving fatigue and maternal functioning. This would contribute to postpartum mothers performing self-care activities for their wellbeing and their newborns. Although the NL PPSC was planned as a brief practical intervention, in reality the allocated time for intervention took more than

usual as participants required more clarification. Therefore, duration of interventional time may need to be increased for future implementation. In regards to nursing theory, the conceptual framework used in this study offers a framework for generating nursing knowledge theoretically. Finally, this study identifies recommendations for further studies. For example, exploratory studies on self-efficacy and postpartum depression, and developing culturally appropriate postpartum self-care instruments for use in Bangladesh.

B. Development of the NL PPSC Intervention

The NL PPSC intervention was systematically developed based on the ADDIE model, building on intervention components based on previous study findings and utilizing strategies to promote self-efficacy. The final intervention included common fatigue management content such as rest and relaxation, time management, and rearranging usual activities, aiming to strengthen maternal confidence and encourage to prioritize their tasks near to hand. Maternal functioning areas included perineal wound, breastfeeding, baby bath, and newborn care, through lecture and demonstration with video clips, which are strategies supported by previous studies

(Bagherinia et al., 2016; Shafaie et al., 2017; Shorey et al., 2015). For postpartum care knowledge, postpartum lochia discharge, prevention of postpartum infection, proper nutrition prevention of constipation, and pelvic floor muscles exercise were included (Jeon & Hwang., 2013; Oleiwi, & Ali, 2010) to increase mothers understanding and confidence to perform self-care behaviors.

Regarding the main four sources of self-efficacy theory (Bandura 1977, 1994) enactive mastery, vicarious experiences, verbal persuasion, and physiological feedback were integrated. For example, discussions on postpartum care knowledge and fatigue management acted as verbal persuasion for mothers to know and understand postpartum self-care. Demonstration on how to use sanitary napkins, change diapers, performing newborn bath and umbilical care through video clip and role modelling were examples of enactive mastery. Physiological feedback was utilized through interaction and observing their facial response. Furthermore, implementation of the NL PPSC for first time mothers in Bangladesh was feasible and well received.

Strengths and limitations of the study

This NL PPSC intervention has strengths from various aspects. Intervention

was developed based on ADDIE methodological frame and components of the intervention were developed based on Bangladesh context and validated by five national experts with a CVI of .94. It was delivered via Bengali, the target language of the sample, by a single intervener, using multimedia with small group 2-3 participants. Participating mothers could freely ask any questions. Setting the intervention in the postpartum ward before discharge, was a feasible time when new mothers are eager to know about protecting their health status and caring for their newborn as well. Demonstration with the video clip made participants feel more efficacious to perform postpartum self-care and maternal functioning. Another strength was the follow up telephone counseling, which made a bridge of communication and served as a reminder to mothers to follow the actions written on the brochure. Using advanced statistics, i.e., the LMM, allowed adjusting for covariates while accounting for missing values across the three time points and is also a strength of this study.

In spite of above strengths, there are also limitations noted in this study. The low values of internal consistency for some instruments may have been a source of measurement error. This may be related to the fact that although the questionnaire was administered face-to-face to facilitate understanding and completion, the timing,

i.e., immediately after delivery, may not have been the best time. For example, ‘I am a good mother’, or ‘I hold my newborn smoothly’ may have been sources of measurement and response bias. Furthermore, selection of study setting was from only one public hospital (DMCH), and convenience sampling might be a threat of selection bias.

VII. CONCLUSIONS

The NL PPSC program was the first study to develop a comprehensive and theory-based program aiming to decrease postpartum fatigue and depressive mood and increase maternal functioning of first-time postpartum mothers. It was developed theoretically based on concepts of self-efficacy. It allowed and supplemented experts’ comments and postpartum mothers’ expected need in postpartum self-care, according to the ADDIE model.

The NL PPSC was effective in decreasing postpartum fatigue and increasing postpartum maternal functioning of first-time mothers in Bangladesh. However it was not found to be effective in decreasing postpartum depressive mood. The NL PPCS was effective in improving self-efficacy, self-care behaviors, and PP care knowledge at both 2 weeks and 6 weeks. PP care knowledge was effective in improved maternal

functioning, the supports implementing the NL PPSC for new mothers following delivery.

Further studies are needed to expand the NL PPSC in terms of intensity and/or frequency of contact, as well as consider follow up measurement for a longer period. Further exploratory and interventional studies are also needed on postpartum depression, and development of postpartum self-care instruments based on Bangladesh context.

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APPENDIXES

Appendix 1: Report of Institutional Review Board



연세대학교 간호대학
YONSEI UNIVERSITY COLLEGE OF NURSING

120-752 서울시 서대문구 연세로 50-1 / Tel : (82-2)2228-3234~7 / Fax : (82-2)392-5440 / <http://nursingcollege.yonsei.ac.kr>

April 14th, 2017
To Whom it May Concern,

This letter is to inform you that the study "*Development and Evaluation of a Comprehensive Postpartum Self-care Program for First-time Mothers in Bangladesh*" was reviewed and approved by the Institutional Review Board (IRB) of the College of Nursing, Yonsei University.

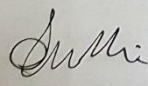
The study approval period is from April 14, 2017, to February 28, 2018, and a brief description of the study is as follows. Further details can be obtained from the researcher.

- Design: Quasi-experimental study
- Participants: First-time mothers who deliver at Dhaka Medical College Hospital (DMCH). A total of 68 participants (34 for experimental group, 34 for control group)
- Expected site of recruitment: Two public institutes – DMCH & EPI center, Mohakhali, Dhaka
- Data collection: Data will be collected using seven sets of self-report questionnaires: (1) Demographic information, (2) Postpartum Self-care Knowledge Questionnaire, (3) Postpartum Self-efficacy Questionnaire, (4) Postpartum Self-care Practice Questionnaire, (5) Postpartum Fatigue Scale, (6) Edinburgh Postpartum Depression Scale, and (7) Postpartum Functional Status scale.

According to our IRB conditions, the primary investigator, Fahima Khatun, RN, MN, PhD(c) (fahimamasud@yahoo.com) will abide by the approved status and follow through with us until the study is completed.

Your kind assistance for this study would be greatly appreciated. Should you have further questions on any ethical issues related to this study, please feel free to contact us at nursingirb@yuhs.ac.

Sincerely,



Sue Kim, RN, PhD, NP
Chair, College of Nursing IRB

Appendix 2: Approval letter of DMCH for data collection (Bengali version)

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
পরিচালকের কার্যালয়
ঢাকা মেডিকেল কলেজ হাসপাতাল

তারিখ : ০৪/১৭ ইং

স্মারক নং ঢামেকহা/সেবা-প্রশাঃ/

বিষয় : ৪ ডাটা সংগ্রহের জন্য অনুমতি প্রদান প্রসংগে।

ফাহিমা খাতুন, ডেমপলট্রিটর, বগুড়া নার্সিং কলেজ, বগুড়া (যিনি বর্তমানে Yonsei university, seoul, korea তে পিএইচডি ইন নার্সিং কোর্সে অধ্যয়নরত আছেন) কে প্রসবতোর মায়েরদের স্বল্প কর্মসূচী প্রস্তুত করন এবং মূল্যায়ন বিষয়ক গবেষণা কাজ করার নিমিত্তে ঢাকা মেডিকেল কলেজ হাসপাতালে Postpartum Ward এ ভর্তিরত প্রসবতোর মায়েরদের নিকট হইতে তথ্য সংগ্রহ করার অনুমতি প্রদান করা হইল।

(ডাঃ মোঃ জাকির হোসেন)
উপ-পরিচালক
পরিচালকের পক্ষে
ঢাকা মেডিকেল কলেজ হাসপাতাল

তারিখ ২৭/০৪/১৭ ইং

স্মারক নং ঢামেকহা/সেবা-প্রশাঃ/ ৪৪৮৬

অনুলিপি অবগিত ও প্রয়োজনীয় ব্যবসাধু গ্রহনের জন্য প্রেরন করা হইল :

০১। মহাপরিচালক, নার্সিং ও মিডওয়াইফারি অধিদপ্তর, কলেজ অব নার্সিং একাডেমিক ভবন, শেরে বাংলা নগর, ঢাকা - ১২০৭।
০২। অধ্যাপক ও বিভাগীয় প্রধান, গাইনী এন্ড অবস বিভাগ, ঢাকা মেডিকেল কলেজ হাসপাতাল, ঢাকা।
০৪। সহকারী পরিচালক(প্রশাঃ), ঢাকা মেডিকেল কলেজ হাসপাতাল, ঢাকা।
০৬। সেবা তত্ত্বাবধায়ক, ঢাকা মেডিকেল কলেজ হাসপাতাল, ঢাকা।
০৭। পরিচালক মহোদয়ের ব্যক্তিগত সহকারী, ঢাকা মেডিকেল কলেজ হাসপাতাল, ঢাকা।
০৮। ফাহিমা খাতুন, ডেমপলট্রিটর, বগুড়া নার্সিং কলেজ, বগুড়া, বর্তমানে Yonsei university, seoul, korea তে পিএইচডি ইন নার্সিং কোর্সে অধ্যয়নরত আছেন।

ফাহিমা
২৭.৪.১৭
উপ-পরিচালক
ঢাকা মেডিকেল কলেজ হাসপাতাল

Appendix 3: Information Sheet for Research Participants

1. Title

Evaluation of a Nurse-led Postpartum Self-care Program for First-time Mothers in Bangladesh.

2. Purpose

Postpartum is an important period for physical and psychological adaptation of mothers after childbirth. Physical recovery and maternal role in newborn care is a great challenge especially for first-time mothers after hospital discharge. Postpartum self-care is the maternal knowledge and ability to perform self-care activities for maintaining their health and their newborn as well. Introduction of ‘postpartum self-care’ may encourage mothers to promote self-care knowledge and perform self-care behaviors. Therefore, a postpartum self-care program is needed for first-time mothers.

The purpose of this study is to develop the program and to find out if the program is effective to maternal outcomes. This study is for doctoral dissertation.

3. Participants

The participants will be 68 mothers who delivered first-time and admitted in the

postpartum ward in Dhaka Medical College Hospital, Dhaka. If you agree to participate in this study, you can participate if you are: a first-time mother who delivered naturally (spontaneous vaginal delivery); your baby's 5 min APGAR ≥ 7 ; postpartum duration ≤ 1 week; able to read and understand; and willing to participate. But you will be excluded from the study if you delivered twin/multiple infants; have severe illness due to postpartum complications for example, postpartum bleeding, puerperal sepsis, and psychosis; would receive newborn's vaccines other than DMCH & EPI center Mohakhali, Dhaka; and do not have facilities of phone call for further communication. You will be asked to provide your contact number for the purpose of follow up at 6 weeks postpartum during the study periods from April to December, 2017. Even after you decide to participate in the study, you may stop your participation at any time without any harm.

4. Method

If you decide to participate, there will be 2 groups to compare the effect of the program, and you will be assigned according to when you deliver (month of birth). If you are part of the intervention group you will participate in 2 small group sessions duration 1 hour and 10 min in each. Control group will receive usual postpartum care

offered in the hospital and later on the health information leaflet after final data collection. The researcher will distribute the questionnaires set, provide contact number to communicate with research team, and will ask for your contact number for further communication (this information is for follow up purpose only, and will be kept confidential).

You will be asked to fill out a questionnaire set over 3 times. This is expected to take 20-25 minutes and includes questions on how mothers perceive their self-care ability and practice postpartum self-care, such as recognizing abnormal discharge, episiotomy wound care, family planning and care of your newborn. I will also ask you about your physical and emotional health status and postpartum wellbeing. The 3 times for filling out the questionnaire will be within 1st week in postpartum ward; 2 weeks of postpartum period by postal mail, and 6 weeks at EPI centers when you come to receive your baby's vaccination by face to face interview. If it is difficult to understand any item, you may ask the researcher to explain to you. After completion, please drop it in the collection box in your ward.

5. Expectation

The findings of the study will help postpartum mothers to perform self-care activities

and newborn care at home, and guide nurses to provide postpartum self-care intervention.

6. Risks

The risks are minimal, because all the questions and information are cognitive basis. During the study period, if you feel any discomfort, pre-arranged health care providers will provide management.

7. Participants protection

Your personal data will be protected by maintaining confidentiality. This study will not use your name or any of your identity. All data will be collected using code numbers. For follow up data, the researcher would use separated contact information. Even though research assistant would collect mostly 3rd time data, she also will not know about your identity due to using password. You will have right to withdraw at any time, and if you withdraw from the study, your information will be deleted. You can be ensured that your confidentiality and anonymity will be maintained. You also can be ensured that the information that you provide will not disclosed to others. It will be kept in a secure locked cabinet for three years and after that it will be discarded. The results of this research study may be presented at scientific or

professional meetings or published in scientific journals. In this case information will be presented as aggregate data to maintain personal confidentiality.

8. Voluntary participation

If you have read or heard this information and have decided to participate in this project, please understand your participation is voluntary. There is no harm in participation. You have the right to refuse to answer particular questions. Even after deciding to participate in this study, you may stop at any time, and there will no risk to you due to dropping out.

9. Compensation

For participation in this study, you will be offered a small gift voucher, amount of approximately 300 Taka (4 US Dollars) at the end of final 3rd data collection at 6th weeks at EPI center when you will come for your baby's immunization.

10. Contact Information:

If you have any questions, concerns or complaints about this research, its procedures, risks and benefits, contact the Principal Investigator.

Principal Investigator

Fahima Khatun
PhD in Nursing Student
Yonsei University College of Nursing,
Seoul, Korea
E-mail: fahimamasud@yahoo.com;
fahimabizly@gmail.com
Cell Phone No. +82-10-62750546 (Korea)
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Advisor

Professor Sue Kim
Yonsei University College of Nursing,
Seoul, Korea
E-mail: suekim@yuhs.ac
Cell Phone No. +821072523077

11. Independent Contact (IRB)

If you are not satisfied with how this study is being conducted, or if you have any concerns, complaints, or general questions about the research or your rights as a participant, you may contact the Yonsei University Institutional Review Board (IRB) to speak to someone independent of the research team at (02-2227-7909) or **e-mail:** nursingirb@yuhs.ac. You can also write to the Yonsei University IRB, College of Nursing, Yonsei University, 50 Yonsei-ro, Seodemun-gu, Seoul, Korea (120-752).

Appendix 4: Consent Form

Consent Form		
[Study Title]	Evaluation of a Nurse-led Postpartum Self-care Program for First-time Mothers in Bangladesh.	
<ul style="list-style-type: none"> ● I have received sufficient explanation on the study purpose, participation method, estimated effects, possible risks, confidentiality and anonymity, and understand what is involved. ● I have been provided with a copy of the information sheet and consent form. ● I have received satisfactory answers to any questions about the study. ● Contact information has been provided, should I have any questions. ● After due consideration and by voluntary will, I have decided to participate in this study. ● I give consent for the data to be used for future academic purposes. ● I understand that I can withdraw my participation at any time, and that is no risk involved. 		
Participant	Date (MM/DD/YY)	
	Name	(sign)
Researcher	Date (MM/DD/YY)	
	Name	(sign)
	Contact info	

Appendix 5: Flyers

Evaluation of a Nurse-led Postpartum Self-care Program for First-time Mothers in Bangladesh.

.....

The above program is inviting first-time mothers to participate.

This program offers comprehensive teaching and support for self-care following delivery.

If the following fits you, you can join!

- Are you a first-time mother who delivered within 7 days?
- Did you deliver naturally? (No Surgery)
- Are you able to read and write Bengali?
- Did you deliver one baby? (No twins)
- Will you bring your baby to Immunization centers of Dhaka Medical College or EPI center at Mohakhali, Dhaka for 6th week vaccination?

Participation will be voluntary. If you decide to participate, you may participate in the Self-care Program, offered as a small group session during your hospital stay. You will be asked to fill out questionnaires (expect time 20-25 minutes) three times: once during your hospital stay, again 2 weeks later (to mail back), and finally at 6 weeks when you go to EPI for your baby's vaccination. After the last questionnaire is completed you will be given a small gift voucher of 300 Taka (equivalent to 4 US Dollars).

If you are interested, please let the Ward In charge know and she will connect you to the researcher, or you can contact the research team directly as follows:

Fahima Khatun

Ph.D student, Womens Health Nursing, Yonsei University, South Korea

Demonstrator, Bogra Nursing College, Bogra, Bangladesh

Contact Number 01716455559

Appendix 6: Questionnaire Set

□ □ □ - □ □

Socio-demographic Information

Instruction:

Please put the ✓ (**Tick Mark**) on the answers that best fit you.

1. Age :years.
2. Highest educational level: 1. ☐ Primary school 2. ☐ Secondary School (SSC)
3. ☐ Higher Secondary School (HSC) 4. ☐ More
3. Living status:
1. ☐ Live with husband 2. ☐ With his family 3. ☐ My parent's family
- 4 Occupation:
1. ☐ House wife 2. ☐ Working outside
5. Monthly family income:Tk.

Delivery Related Information (From Information Chart)

1. Episiotomy: 1. ☐ Yes 2. ☐ No
2. Gestational age wks
3. Postpartum duration.days postpartum
4. General condition of newborn.
 1. ☐ Fair (APGAR score ≥ 7)
 2. ☐ Good (APGAR score 8)
 3. ☐ Very good (APGAR score > 8)
5. Sex of newborn
 1. ☐ Female 2. ☐ Male
6. Number of participation in parenting preparation class:
 1. ☐ None 2. ☐ One 3. ☐ Two 4. ☐ More than Two
7. Number of antenatal visits:
 1. ☐ None 2. ☐ One 3. ☐ Two 4. ☐ Three 5. ☐ \geq Four

Postpartum Self-care Knowledge Questionnaire

Instruction:

Please put the ✓ (**Tick Mark**) on your best answers you perceive as correct.

Items		Yes	Don't know	No
1	The postpartum means a time for new mothers to take care of herself			
2	Lochia (vaginal discharge) is seen for 4-6 weeks after childbirth			
3	When feeling the uterus in the belly, the softer, the better.			
4	Making postpartum mothers sweat on purpose is good for them.			
5	Tub baths are possible 4 weeks after childbirth.			
6	Contraception should be used from the first time resuming marital sex.			
7	Breastfeeding helps the uterus to contract/shrink back.			
8	Perineal care (cleaning perineum, exchanging pads) should be done from front to back motions.			
9	Iron supplements are not needed after childbirth.			
10	Breastmilk production depends on how much breastmilk is used			
11	To get rid of swelling it's better to avoid drinking water.			
12	Water temperature of 38-42 °C is good for sitz bath.			
13	Breast massage helps soothe breast discomfort and stimulates breast milk secretion.			
14.	Sexual intercourse should be avoided during the time lochia is seen.			

Items		Yes	Don't know	No
15	Exercise helps the uterus to contract and promotes blood circulation.			
16	When breastfeeding, the breasts should be cleaned with soap.			
17	Starting walking early (within 24 hours of childbirth) helps with regaining your health quicker.			
18	Pelvic floor muscle exercise (Kegel exercise) can prevent urinary incontinence.			
19	Whether breastfeeding or not, the calories recommended for new mothers are the same.			

Postpartum management self-efficacy tool

The following questions are about self-efficacy regarding postpartum self-care and newborn care. Please mark with a “✓” as appropriate.

	Content	Very confident	Somewhat confident	Not much confident	Not confident at all
1	Based on knowledge of danger signs, I can come to the hospital as necessary.	4	3	2	1
2	I can re-start sexual activity at the appropriate time.	4	3	2	1
3	I can practice family planning with the appropriate method.	4	3	2	1
4	I can maintain practicing postpartum exercises.	4	3	2	1
5	I can manage my perineal hygiene.	4	3	2	1
6	I can promote postpartum recovery by eating appropriately.	4	3	2	1
7	I can take appropriate rest for my body's recovery.	4	3	2	1
8	I can take care of (deal with) issues that occur during the	4	3	2	1

	postpartum period.				
9	I can prevent constipation that may occur postpartum.	4	3	2	1
10	I can bathe my newborn alone.	4	3	2	1
11	I can keep the newborn immunization schedule.	4	3	2	1
12	I can change my newborn's diaper alone.	4	3	2	1
13	I can soothe my crying newborn by myself.	4	3	2	1
14	I can comfortably hold my newborn.	4	3	2	1
15	I can breastfeed or bottle feed by myself.	4	3	2	1

Self-care Practice Instrument

General Instructions:

Please fill in the number that best answers each question for you. There is no right or wrong answers. Please feel free to write in comments. For all questions about your health, please answer based on what you think health is for you.

1 = Strongly disagree, 2 = Disagree, 3 = Somewhat disagree, 4 = Neither agree or disagree, 5 = Somewhat agree, 6 = Agree, 7 = Strongly agree

Items		Likert Scale						
1.	You do things that are good for your health	1	2	3	4	5	6	7
2.	You take good care of your health	1	2	3	4	5	6	7
3.	You follow through on decisions you make about your health	1	2	3	4	5	6	7
4.	You <u>put off</u> doing things that would be good for your health	1	2	3	4	5	6	7
5.	You eat breakfast	1	2	3	4	5	6	7
6.	You eat the kinds of foods you think are necessary for your health	1	2	3	4	5	6	7
7.	You eat a balanced diet	1	2	3	4	5	6	7
8.	You do things to maintain or achieve good nutrition for yourself	1	2	3	4	5	6	7

9.	You do things to get the amount of activity you think is necessary for your health	1	2	3	4	5	6	7
10.	You do things to get the amount of rest you think is necessary for your health	1	2	3	4	5	6	7
11.	You do things to maintain or achieve a <u>balance</u> between rest and activity	1	2	3	4	5	6	7
12.	You do things to get the amount of time alone you think is necessary for your health	1	2	3	4	5	6	7
13.	You do things to get the amount of time with others that you think is necessary for your health	1	2	3	4	5	6	7
14.	You do things to maintain or achieve a balance between time alone and time with others	1	2	3	4	5	6	7
15.	You do things to keep your bladder and bowel habits normal	1	2	3	4	5	6	7
16.	You do things to keep yourself safe	1	2	3	4	5	6	7
17.	You do things to feel less stressed	1	2	3	4	5	6	7
18.	You do things that help you to “be all that you can be” as a person	1	2	3	4	5	6	7

Postpartum Fatigue Scale (PFS)

Instruction: Please rate your fatigue level and fill up the following items as you feel 1= Not at all; 2 = Rarely; 3 = Sometimes; 4 = All the times.

Items		Not at all	Rarely	Sometimes	All the times
1	My head feels heavy	1	2	3	4
2	My body feels tired	1	2	3	4
3	My legs feel tired	1	2	3	4
4	My brain feels hot or muddled	1	2	3	4
5	I am drowsy	1	2	3	4
6	I want to lie down	1	2	3	4
7	It's difficult to think	1	2	3	4
8	I get weary talking	1	2	3	4
9	I can't concentrate	1	2	3	4
10	I am apt to forget things	1	2	3	4

Edinburg Postpartum Depressive Symptoms Questionnaire

Instruction: Please select the number next to the response that comes closest to how you have felt in the past seven days.

1.	I have been able to laugh and see the funny side of things	
	0 <input type="checkbox"/>	As much as I always could
	1 <input type="checkbox"/>	Not quite so much now
	2 <input type="checkbox"/>	Definitely not so much now
	3 <input type="checkbox"/>	Not at all
2.	I have looked forward with enjoyment to things	
	0 <input type="checkbox"/>	As much as I ever did
	1 <input type="checkbox"/>	Rather less than I used to
	2 <input type="checkbox"/>	Definitely less than I used to
	3 <input type="checkbox"/>	Hardly at all
3.	I have blamed myself unnecessarily when things went wrong	
	0 <input type="checkbox"/>	Yes, most of the time
	1 <input type="checkbox"/>	Yes, some of the time
	2 <input type="checkbox"/>	Not very often
	3 <input type="checkbox"/>	No, never
4.	I have been anxious or worried for no good reason	
	0 <input type="checkbox"/>	No, not at all
	1 <input type="checkbox"/>	Hardly ever
	2 <input type="checkbox"/>	Yes, sometimes
	3 <input type="checkbox"/>	Yes, very often
5.	I have felt scared or panicky for no very good reason	
	0 <input type="checkbox"/>	Yes, quite a lot
	1 <input type="checkbox"/>	Yes, sometimes
	2 <input type="checkbox"/>	No, not much
	3 <input type="checkbox"/>	No, not at all

6.	Things have been getting on top of me	
	0 <input type="checkbox"/>	Yes, most of the time I haven't been able to cope at all
	1 <input type="checkbox"/>	Yes, sometimes I haven't been coping as well as usual
	2 <input type="checkbox"/>	No, most of the time I have coped quite well
	3 <input type="checkbox"/>	No, I have been coping as well as ever
7.	I have been so unhappy that I have had difficulty sleeping	
	0 <input type="checkbox"/>	Yes, most of the time
	1 <input type="checkbox"/>	Yes, sometimes
	2 <input type="checkbox"/>	Not very often
	3 <input type="checkbox"/>	No, not at all
8.	I have felt sad or miserable	
	0 <input type="checkbox"/>	Yes, most of the time
	1 <input type="checkbox"/>	Yes, quite often
	2 <input type="checkbox"/>	Not, very often
	3 <input type="checkbox"/>	No, not at all
9.	I have been so unhappy that I have been crying	
	0 <input type="checkbox"/>	Yes, most of the time
	1 <input type="checkbox"/>	Yes, quite often
	2 <input type="checkbox"/>	Only occasionally
	3 <input type="checkbox"/>	No, never
10.	The thought of harming myself has occurred to me	
	0 <input type="checkbox"/>	Yes, quite often
	1 <input type="checkbox"/>	Sometimes
	2 <input type="checkbox"/>	Hardly ever
	3 <input type="checkbox"/>	Never

Postpartum Maternal Functioning Index

General Instructions:

Please circle the number that best represents how you have felt over the past two weeks .
Please try to answer the question as honestly possible as your responses will help us to better understand the postpartum experience.

0 = Strongly disagree, 1 = Disagree, 2 = Somewhat disagree, 3 = Neither agree or disagree, 4 = Some what agree, 5 = Agree, 6 = Strongly agree

Items								
1	I am a good mother.	0	1	2	3	4	5	6
2	I feel rested.	0	1	2	3	4	5	6
3	I am comfortable with the way I've chosen to feed my baby (either bottle or breast, or both).	0	1	2	3	4	5	6
4	My baby and I understand each other.	0	1	2	3	4	5	6
5	I am able to relax and enjoy time with my baby.	0	1	2	3	4	5	6
6	There are people in my life that I can trust to care for my baby when I need a break.	0	1	2	3	4	5	6
7	<i>I am comfortable</i> allowing a trusted friend or relative to care for my baby (can include baby's father or partner).	0	1	2	3	4	5	6

8	I am getting enough adult interaction	0	1	2	3	4	5	6
9	I am getting enough encouragement from other people.	0	1	2	3	4	5	6
10	I trust my own feelings (instincts) when it comes to taking care of my baby.	0	1	2	3	4	5	6
11	take a little time each week to do something for myself	0	1	2	3	4	5	6
12	I am taking good care of my baby's physical needs (feedings, changing diapers, doctor's appointments).	0	1	2	3	4	5	6
13	I am taking good care of my physical needs (eating, showering, etc).	0	1	2	3	4	5	6
14	I make good decisions about my baby's health and well being.	0	1	2	3	4	5	6
15	My baby and I are getting into a routine	0	1	2	3	4	5	6
16	I worry about how other people judge me (as a mother).	0	1	2	3	4	5	6
17	I am able to take care of my baby and my other responsibilities	0	1	2	3	4	5	6
18	Anxiety or worry often interferes with my mothering ability.	0	1	2	3	4	5	6
19	<i>As time goes on</i> , I am getting better at taking care of my baby.	0	1	2	3	4	5	6
20	I am <i>satisfied</i> with the job I am doing as a new mother	0	1	2	3	4	5	6